COMMUNITY FISH FARMING SYSTEM IN JAMUNAPAR REGION OF ALLAHABAD DIST. (U. P.) WITH SPECIAL REFERENCE TO ECONOMICS AND PROBLEMS

THESIS

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DEDICATED TO
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PARENTS

CERTIFICATE OF ORIGINAL WORK

*This is to certify that studies conducted by **Mrs. BIPASHA DAVID (Mehera)** during 1998-2000 as reported in the present thesis was under my guidance and supervision. The results reported by her are genuine and the candidate has written herself the script of the thesis herself.*

*Her thesis entitled **"COMMUNITY FISH FARMING SYSTEM IN JAMUNAPAR REGION OF ALLAHABAD DIST. (U.P.), WITH SPECIAL REFERENCE TO ECONOMICS AND PROBLEMS"**, is therefore, being forwarded for the acceptance for the award of Degree of DOCTOR OF PHILOSOPHY in the faculty of Science, University of Allahabad.*

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CONTENTS

CONTENTS OF TABLE

CONTENTS OF FIGURE

CHAPTER I

INTRODUCTION

Fish is a dynamic and renewable resource with considerable potential. It is also a very economical and rich source of animal protein.

Out of the 23% of India's total animal protein supply in the diet, the fish amounts for a mere 2.3%, even when a widely variety of species contribute to the total production (ICAR now and ahead … 1998).

Though aquaculture is an age-old practice in India, it received due attention only in the recent years. This may be due to revised Government policies in promoting aquaculture as a major industry.

Global demand for protein rich food is on an upward trend. Even among the proteinacious food items, people prefer food, which is of high quality protein, readily available to fit everybody's life style and budget.

In fulfilling the protein demand, aqua foods comprising of fish and fishery products play a remarkable role. The importance given to aqua food in the developing countries may be less due to their native food habits, but westerners will invariably have a dish prepared out of fish or other aquatic

animals. The existing demand for high quality aqua foods in the developed countries has forced farmers and entrepreneurs in developing countries to produce them at extra cost on otherwise.

1.1 ROLE OF FISH IN HUMAN NUTRITION:

For the poor and common man, fish is nutritionally important. It provides easily digestible protein, which has an amino-acid profile, particularly Lysine, not necessarily available from other proteins. Fish fat is rich in n-3 polyunsaturated fatty acids which have health benefits in protection against cardio-vascular diseases, in development of brain and nerves, foetal and infant growth and also protection against diabetes, infections and even some types of cancer. Fish is also a rich source of Vitamins B_{12}, A, E and D. Fish also contains trace elements like Selenium, low sodium (suitable for people with blood pressure) and other minerals of nutritional significance like calcium, potassium, iron and copper etc. **(Gopa Kumar 1999)**.

The contribution of fish to nutrition varies from place to place depending upon the economic status of the nations. Traditions, food habits and

social attitude also influence fish eating. In India only 56% of people are fish eaters.

Fish as a food has some advantages over other food items. It is not associated with religious taboos, e.g. pig meat for Muslims and Jews and beef for Hindus. In many developing nations fish is still an affordable cheap animal protein.

1.2 PER CAPITA FISH CONSUMPTION :

The world's per capita fish consumption is about 15 kg per year. It is 8 kg for developing countries and 25 kg for developed countries. The per capita fish consumption for India and Bangladesh is even lower, while the recommended quantity to meet the basic nutritional requirement from fish 11 kg/yr./capita. But in case of India it increase from 2.08 (**Nandeesha, 1993**) to 10 kg/yr./capita (**Ninawe 1999**). Thus we have to increase our per capita fish consumption level by increasing fish production (**Appendix-1**).

1.3 FISHERIES RESOURCES :

1.3.1 Indian fisheries Resources:

Indian fisheries resources are vast and varied. It can be divided into two categories. Indian capture fisheries resources and Indian fresh water aquaculture (**Appendix-2**).

Of the total potential water spread area of 8.648 million ha only around 1.0 million ha is utilised for aquaculture **(Nandeesha, 1993)**.

1.3.2 **Fresh water resources of Uttar Pradesh for aquaculture:**

U.P. is one of the most important states of India. It is endowed with an abundance of confined water resources of different categories (ponds, tanks, reservoirs and lakes) which are suitable for the development of aquaculture as an industry. Rich in these resources, besides rivers, irrigation canals and other flowing water such as streams; the state has a water area of about 11.65 Lakh ha. Out of this rivers and canals are having an area of 7.20 ha, while these running water areas are not directly used for adjacent rural ponds for community use, including aquaculture.

Of the 4.45 Lakh ha of lentic fresh water resources about 51.24% have been brought under fish culture. However, the manner of utilisation is unsatisfactory **(Appendix-3 & Appendix-4)**

1.3.3 **Fresh water resources of Allahabad district**

The district has vast potential of fish farming with 3463 ponds covering 3381 hectares of water area. On an average 100 hectares of water area has been

developed each year. Four perennial rivers, Viz. Ganges, Yamuna, Tons and Belan flow through the district. Besides, four perennial rivers, the district have a net work of 2294 kilometres of canal. Two reservoirs Viz. Gularia and Bagla are located in this district where extensive fish farming is done by the societies.

1.4 FISH PRODUCTION:

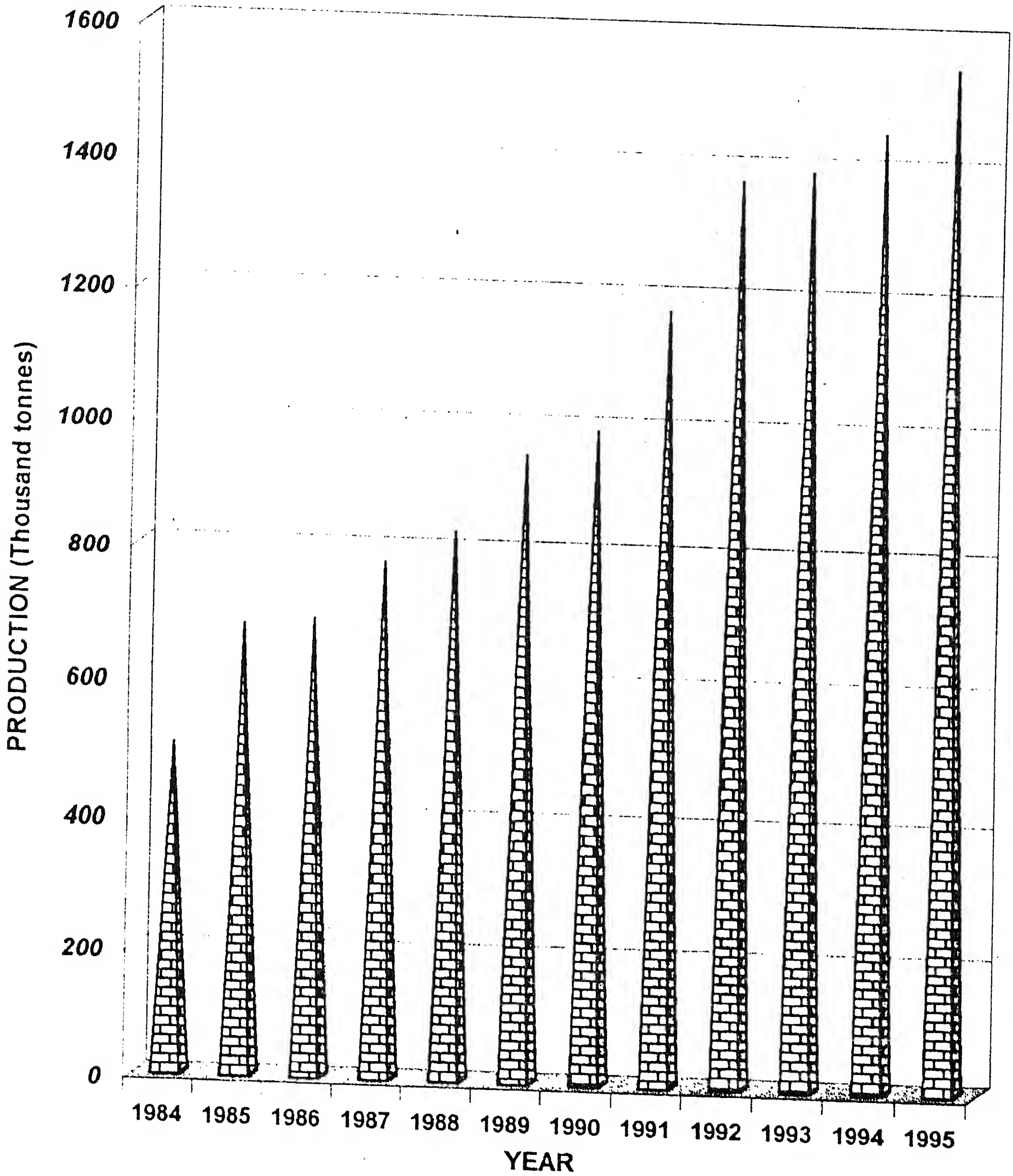
Valuable proteins at low costs, attractive economic returns and gainful employment have made fresh water aquaculture a fast growing sector among the farming enterprises.

The total global fish production was 109.59 million tonnes during 1994. This figure includes the production from capture and culture fisheries. The global aquaculture production is estimated to be 19.17 million tonnes **(FAO 1996)**.

1.4.1 Fish production in India :

India produces 2.01 million tonnes. India ranks seventh in the world and first among Commonwealth countries in fish production. However, India exports only 10% of the produce. She is the second largest fish producer from inland sources after China **(ICAR now and ahead ... 1998)**.

FIGURE 1.1 FRESH WATER FISH PRODUCTION IN INDIA (1984 - 1995)



SOURCE : CIFA, NEWSLETTER 1998

1.4.2 Indian fresh water aquaculture production :

The aquaculture has evolved from the stage of a domestic activity to that of an industry in recent years, with technological inputs, governmental investments and entrepreneurial interests, to the extent that one third of country's present fish production of 4.49 mmt is fresh water aquaculture **(Appendix-5), (Fig.-1.1).**

1.4.3 Inland fish production :

Among inland fish production 54.7% are major carps, 27.5% are other fishes, 8.1% are common carps, 6.1% are other carps and only 3.6% are Murrels **(Fig.-1.2).**

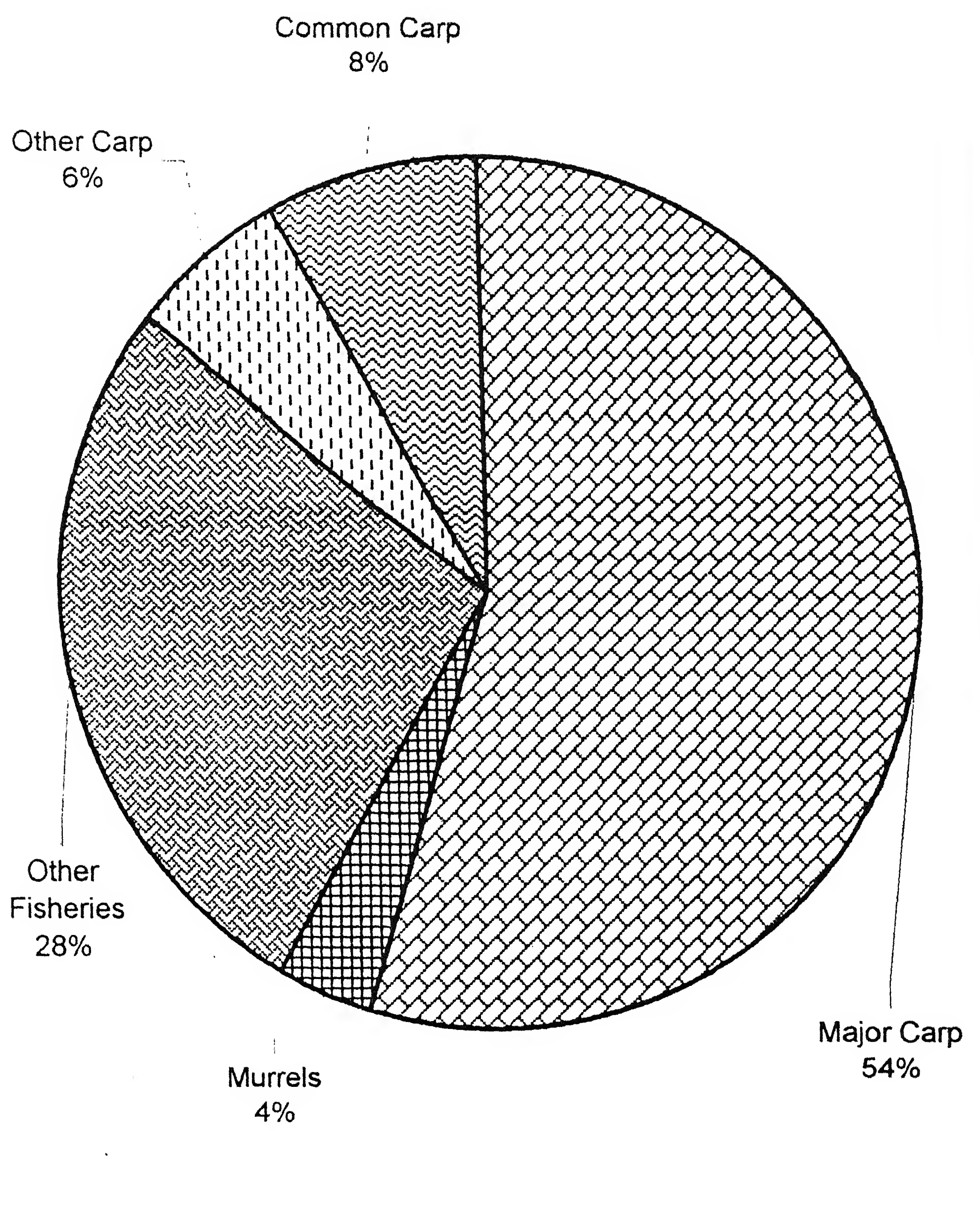
1.4.4 Fish Production in U.P. :

The state U.P. has 162,000 ha of ponds and tanks and present estimated fresh water aquaculture production is 100,000 tonnes. it is projected that the state could produce 292,000 tonnes of fish from 100,000 ha water area. **(De *et*. *al*. 2000).**

1.4.5 Fish seed production in U.P.:

The total number of private and Govt. sector hatcheries in the state are 125, with production more than 7000 lakh of seed/annum.

Figure 1. 2 INLAND FISH PRODUCTION PERCENTAGE



SOURCE : CIFA, NEWSLETTER 1998

Community fish farming system :

India is endowed with innumerable small fresh water ponds, widely scattered all over the country. These small water bodies are utilised for multipurpose use like irrigation to agricultural fields, washing the cattle, domestic purposes and above all, the fish culture too in these days. In villages fresh water fish culture in community pond is livelihood of most families. The village panchayats started commercial fish farming in these community ponds. Some ponds were given under contract to the local people (preferably Mallah) and the rest were farmed by the village panchayat itself.

In community fish farming system (CFF) different communities participate in fish raising from single pond. Most of the farmers cannot afford all the items needed for raising fish. Therefore, they enter into joint ventures dividing the input required and profit made into shares.

One farmer rarely has sufficient money and labour to invest in fish farming and therefore invites others to invest in joint ownership. Most shareholders in a particular pond are of the same family or community, resulting in maximum

participation and allowing the benefits to be kept within the group.

In CFF system, most shareholding contracts are oral and the conflicts that arise from them are also resolved orally. They are not resolved by legal courts or agencies but by the shareholders themselves. Village elders and panch leaders may be called in to participate in finding a solution.

1.5.1 Practice of composite fish culture in community fish farming system in Allahabad district:

In community fish farming system (CFF) of Allahabad district, farmers practised composite fish culture or mixed fish culture because this type of culture improved the production from the community pond. Composite fish culture involves stocking of compatible species of different feeding habits in order to utilise the food spectrum available in different ecological niches of the village community pond. The technology (developed in the seventies) has raised the national average to over 2 tonnes/ha/yr. from 50 kg/ha/year though, a harvest of 15 tonnes/ha/year has been demonstrated by the ICAR Scientists.

It is important to consider how best the knowledge of modern scientific culture is transferred to increase the fish production levels of such small

and large community ponds by community fish farming system. The development in this direction will help the country in two ways. First, it increases the purchasing capacity of the rural poor and secondly, increases the production basket in the fish culture sector, ensuring more availability of fish supplies to the farmer and to the consuming public.

1.5.2 Recommended fish species for Allahabad district and their culture practice :

Profitable fish culture aims at maximum production of edible fish flesh in water body by utilising to an optimum extent the natural food and the artificial feed which can be provided at an economically viable level. The basic considerations in the selection of culturable species are:

1. Rapid growth potential;
2. Ability to use the natural food of the pond efficiently and accept artificial feed;
3. It should have small head, high body and thick back;
4. It should be hardy and resistant to disease;
5. It should be non predaceous, planktophagous and preferably herbivorous;
6. it should have low bone to flesh ratio; and

7. It should be palatable with high nutritive value.

For efficient utilisation of natural food resources the fish should ecologically fit into a short food chain system.

Consumers' taste and preference have to be necessarily taken into consideration.

The common cultivated carps, recommended by the F.F.D.A.(Fish Farmers' Development Agency) are Indian major carps and exotic carps.

1.5.3 Stocking rate and species ratio :

The stocking rate and species ratio is to be decided on the basis of the availability of various food materials in the pond as well as the management measures adopted. In an extensive culture practice i.e. without fertilizer and artificial feeding stocking density would be low. In extensive culture practice, stocking rate of 5,000 to 6,000 fingerlings (10 cm in length fish seed) per hectare of water area is recommended by the F.F.D.A. In semi intensive culture practice, i.e. with the fertilizer and artificial feeding, stocking rate of 10,000 - 12,000 fingerling per hectare of water area is recommended by Central Institute of Fresh Water Aquaculture (CIFA).

1.5.5 Development of community fish farming in Allahabad and the Fish Farmers' Development Agency (FFDAs) :

Allahabad district has a large number of confined water area (perennial and seasonal) which offer good potential for fishery development programme.

According to the survey conducted by the departmental team of workers of FFDA, the district has 3467 rural tanks / ponds covering an area of 3381.00 ha excluding the perennial river system, irrigation canals and reservoirs. Out of this, 2933 ponds covering an area of 2660.90 ha are perennial ponds which can be used for fish culture after minor improvement. And every year average 100 ha of water area are improving for fish culture by FFDA.

Fish Farmers' Development Agency (FFDA), Allahabad was established in May 1978. This agency was initially financed by the World Bank and later on from the district fund under plan schemes.

1.6 STATEMENT OF THE PROBLEM :

The problem as identified by the researcher may be stated as follows:

"There is need to evaluate the economics of community fish farming system in Jamuna par region of

Allahabad district and identify the major problems in CFF system, so that suitable measure for its greater adoption may be suggested".

1.7 OBJECTIVES OF THE STUDY :

On the basis of the above problem, the following specific objectives were set up for the present study.

1. To examine the present status of community fish farming (CFF) practice that exist in Jamunapar region of Allahabad District in U.P.;
2. To study the farmers' attitude towards community fish farming (CFF) in the study area;
3. To estimate the development of fallow, unproductive and marginally productive lands for generating employment in rural area;
4. To estimate the economic benefits to be derived from the CFF system on different size of fish ponds in the study area;
5. To estimate the input-out put ratio of different sizes of fishponds in the study area; and
6. To identify the major problem faced by fish farmer and their suggestive measure.

1.8 HYPOTHESES:

(a) Traditional fish farming practices are existing in the study areas.

(b) Success of fish farming is the source of encouragement to the local people to expand them as an additional source of income.

1.9 NEED FOR THE STUDY :

Fish is the cheapest and best source of animal protein and other ingredients to supplement and balance the impoverished diet of rural people. The under utilised and un-utilised rich resources of fresh water bodies both perennial and seasonal of our country is going to be the vital profit making ground for aquaculturists in the near future. There is tremendous scope for expanding and popularising fish farming. There is the crying need to evaluate the economics of fish farming, which will help in yielding a sizeable quantum of produce, which could well be sold in internal and external markets. The high profit margins, when compared to other farming practices will definitely encourage farmer to adopt this technology easily in every village and hamlet.

1.10 LIMITATION OF THE STUDY :

The researcher acknowledged certain limitations in the conduct of the present study. It is limited to:

1. The area of investigation was restricted to villages of three blocks of Chaka, Jasra and Meja. As such, generalisation of the study could be restricted to the area where similar conditions prevail.
2. The study was limited to the extent to which the respondents were able to understand and interpret questions and give answers correctly.
3. The extent to which research procedures are free from personal bias.
4. The extent to which the sample of the study is representative of the entire population.
5. As none of the respondents maintained the records of receipts and expenditures of farming, data were based on the memory of the respondents.

CHAPTER II

REVIEW OF LITERATURE

Review of literature is considered an important aspect of research work as it helps to understand specific problems and to draw some hypothesis. Keeping this in view, literature connected with the problem in hand, has been reviewed, gleaning it from various sources viz., books, journals, dissertations, research projects/surveys etc. Available literature has been classified into various sections, so as to achieve a deep insight into different aspects of the problem. The presentation in this chapter has been made in the following order:

2.1 Fish farming;

2.2 Community fish farming;

2.3 Socio-economic status;

2.4 Role of Fish Farmers' Development Agency (F.F.D.A.);

2.5 Attitude;

2.6 Fish farming and rural employment;

2.7 Economics of fish farming; and

2.8 Problems in fish culture.

2.1 FISH FARMING:

As the heading implies, studies of scholars who have particularly written about fish farming are

given in this section. This section is divided into sub sections:

2.1.1 <u>History of fish farming of India</u>:

Fish production in India is mentioned in the records of Pal dynasty in Bengal (810-850 A.D.). Saneswara refers to two methods of culturing fish in a compilation of 1127 A.D.

'Aina Akbari', the official household manual of Emperor Akbar (11^{th} Century) mentions numerous fish dishes for the royal dinner.

Fresh water aquaculture has been a traditional household practice in the eastern region of the country, with documented evidence even from 11^{th} Century onwards.

Hora (1956) stated that the knowledge of the occurrence of fish in India dates back to three millennium B.C.

Fish remains with cut marks, indicative of their use as food have been obtained from excavations at Mohenjodero and Harappa of the Indus Valley Civilisation (2500 BC - 1500 BC).

2.1.2 <u>Present status and future scope of fish farming in India</u>:

Das <u>et</u>. <u>al</u>. (1999) reported that fish production from inland resources has recorded a ten-fold

increase in the last four decades from 0.22 MT in 1959-51 to 2.44 MT in 1997-98, resulting in a growth rate of 5.06%. Share of Inland production out of total production has increased from 29% in 1950-51 to 45.50% in 1997-98. The present trend, however, is that there is a possibility of production going up from inland sector through aquaculture in the coming year.

Mukhopadhyay (1999) noted that waste water aquaculture mainly carp-culture has been proved as low input and economically viable technology for production of fishes as well as agri-horticultural products, mainly meant for small and marginal farmers.

According to **Murthy (1999)**, the fresh water aquaculture has become a major economic farming activity in Andhra Pradesh, which stands as an example for the rest of the country to emulate. With innovative practices of feeding etc., production rate of 8 to 10 tonnes/ha/year have been achieved in Kolleru region as against the general average of 2 tonnes/ha/yr. Because of increased contribution from fresh water aquaculture, the inland fish production of Andhra Pradesh, as already stated, has increased

from 1.05 Lakh tonnes in 1984-85, to 2.26 Lakh tonnes in 1997-98, while the corresponding increases were from 11.03 Lakh tonnes (1984-85) to 24.38 Lakh tonnes (1997-98) for the entire country.

According to **Reddy and Ayyappan (1999)**, another potential means for enhancing fish production during the coming decades appear to be in the exploitation of the genetic potentialities of our economically important species. Genetics have a potential role to play in aquaculture, the ultimate goal being to improve the per capita availability of fish protein to our masses.

Presently, the improved rohu is under field test in different environments spreading over the country. There after, after an evaluation, it is proposed to release it for regular culture.

Saharan (1999) in his paper entitled "status of Fisheries development in Haryana" has noted that Haryana is now well poised to reach new heights of achievements in fish and prawn production. It will soon emerge as one of the major fish producing states of India.

Agarwal ***et. al.*** **(2000)** reported that recently, the local farmers of Garhwal Himalaya are gaining

interest in fish culture practices by making small ponds in their agriculture fields but due to inadequate scientific knowledge, they are not getting significant profits. There is greater future prospect of cold water fish culture in Garhwal Himalayas.

Bandyopadhyay et. al. (2000) demonstrated trials on carp culture in poly house pond in low temperature areas, where the metabolic activity is greatly reduced during winter there by affecting the fish production. Preliminary trials on carp-culture indicated that higher additional production levels of 114.4% - 130.1% could be obtained in poly house pond compared to control ponds during winter periods.

Chakrabarty (2000) examined potentiality of carp production in sewage fed ponds. The growth rates of all the species (Catla, Rohu, Mrigal, Silver Carp, Grass Carp and Common Carp) and the yield were significantly higher in treated ponds than that of control pond.

De et. al. (2000) collected data in Maharajganj and Barabanki districts of Uttar Pradesh. Extensive carp culture is adapted to a great extent in most areas (80%) and carps form the major produce (85%). Cattle dung, poultry litter, pig dung are the major

manual inputs and rice bran, mustard oil cake, wheat bran, groundnut oil cake and soyabean meal are the important feed resources.

Sehgal and Sehgal (2000) found that the flood plain zone of Punjab (9.59 Lakh ha in 1993) offers a great potential for aquaculture. It is possible to produce 3.5 to 4.5 t/ha in 1993) offers a great potential for aquaculture. It is possible to produce 3.5 to 4.5 t/ha/yr. of fish in traditional close pond system and 14 to 15 t/ha/yr. in partial flow-through system, developed at the Punjab Agriculture University.

2.1.3 Characteristics of FishPond:

Buck (1956) reported faster growth and greater reproduction of fish in less turbid pond.

Islam (1987) showed that pond size affecting fish production pond size showed positive correlation with fish yield.

Jhingran (1991) reported that depth of a pond has an important bearing on the physical and chemical qualities of water. In shallow ponds, sunlight penetrates upto the bottom, warms up the water and facilitates increase in productivity through ponds shallower than 1 m get over heated in tropical summer

inhabits survival of fish and other organisms. A depth of about 2 m is considered from the point of view of biological productivity of a pond.

Kumar Dhirendra (2000) observed that deep pond in which water depth ranged from 1.02 to 2.43 m was suitable for carp culture practices while shallow ponds with water depth from 0.75 to 1.40 m were not congenial for carp culture practice. Shallow ponds are more suitable for air breathing fish culture practice.

2.1.4 Management Practice:

Under the management practice seed, feed, manure and fertilizer and lime have been reviewed.

2.1.4.1 Seed Management:

A) Seed Collection:

Selvaraj and Kanaujia (1979) reported about fish seed rearing in village pond.

Sinha *et. al.* (1979) have reported natural spawning of both grass carp and silver carp in a dry bundh of Bankura district where they were able to spawn the two species without stripping. They consider dry bundhs to be one of the reliable means for mass breeding of Chinese carps to meet the increasing demand of their seed.

According to **Chaudhari and Singh (1984)** induced breeding technique through hypophysation replaced the age-old practice of collection of carp seed from natural habitat.

Sengupta __et__. __al__. (1984) indicated that bundh breeding gave a great impetus to the people of the area where nearly 20,000 families were being directly benefited from bund breeding. Generally the operation of bundhs is carried out from March to August every year and about 20% brooders are generally injected with pituitary/HCG hormones.

According to observations of **Dubey (2000)** more than 50% of spawn is produced from Bankura and Midnapore dry and wet bundhs. It is indicated that 75% of the requirements of the different states in the country are met with from total production of spawn from West Bengal. It is also indicated that, out of the above-mentioned production, nearly 55% of spawn is produced from Bankura District alone and 35% from hatcheries. Hardly 5% of total production are now from the rivers. The major carp spawn brought for sale in Howrah market from bundhs, rivers and hatcheries from district of Bankura and Midnapore of

West Bengal. From Howrah by Railways it is supplied to other states.

Fishing Chimes (2000) give list of 45 carp hatcheries private and public is located in Uttar Pradesh in "State wise inventory of aqua hatcheries". Among 45 carp hatcheries, one public and one private hatchery are located in Allahabad district. In Uttar Pradesh all the hatcheries are of modified Chinese circular type. Ovaprim is the inducing agent generally used by most of the hatcheries.

Sinha (2000) in his paper "Carp seed production system in West Bengal" described that West Bengal; the pioneer state in carp seed production, alone contributes to about 75 percent of the total seed production of the country. The achievements of West Bengal in seed production helped to produce about 45% surplus to cater to the needs of other states of the country.

According to **Vohra (2000)**, in Gujarat modern Chinese hatchery technique is adopted for commercial carp seed production and Ovaprim and Ovatide are used to induce brooders to breed.

B) <u>Stocking Management</u>:

Yashouv (1967) suggested a method for evaluating the efficiency of mixed fish culture over that monoculture in terms of increased fish production in ponds.

Alikunhi *et. al.* **(1971)** concluded that stocking density of 3,000 to 3,500 fingerlings having a total weight of 300 kg to 350 kg/ha is necessary to give a production of 3,000 to 3,500 kg/ha/yr. Under regular manuring and or artificial feeding.

Significant achievement in composite fish culture is the stocking of the pond with fry (34 to 52 mm/0.6 to 2.8 g) at a high density of 8,000/ha in the ratio of Catla 10, Rohu 5, Mrigal 10, Common Carp 25, Silver Carp 30, and Grass Carp 20. Not only the production was the highest (10,194 kg/ha/yr.) so far recorded in India, but also the survival (98.8%) (**Mathew 1971**).

Chaudhuri *et. al.* **(1978)** recorded that high density(13,320 fingerlings/ha) composite fish culture was undertaken in ponds where facilities for replenishing the water existed and average production of 7.6 t/ha/yr., seven times the production obtained by the farmer.

2.1.4.2 Feed and Feeding Management:

Chakraborty et. al. **(1973)** replaced fish meal with soyabean meal without any significant loss in fish weight gain.

Halver (1976) reported that the use of cost-effective diets, formulated on the basis of nutritional requirement of fish species, is the key to success of aquaculture.

Kanaujia (1978) worked on acceptance of artificial feed by cultivated carp in composite fish culture.

Singh and Singh (1979) found that the weight of the fish increased three to four fold in six months when the ponds were fertilized with cowdung and provided with supplementary feed as compared to the weight attained in pond fertilized with cowdung.

Dewan et. al. **(1988)** confirmed that the gross fish production increase where rice bran plus mustard oil cake was supplied as supplementary feed than only rice bran. Analysis of variance showed a significant difference in fish yield under both the treatments.

Swamy and Mohanty (1988) while testing different protein level (30-45%) with fish meal and ground nut oil cake as the major source of protein reported that

the fish feed on 45% protein exhibited the maximum average live weight gain and specific growth rate.

Degani et. al. **(1989)** established direct relationship between growth rate and protein content of diet. Significant higher growth rate of fish was recorded in high protein diet.

De Silva et. al. **(1992)** reported that dietary proteins influence somatic growth of both the sexes but not the gonadial maturation.

Singh and Dhawan (1996) recorded that under field conditions, where the natural food (plankton) is present to meet the minimum feeding requirements of fish, higher protein (more than 30%) diet is not needed for maturing fish but for growth achievement, higher protein level may be advantageous.

According to **Hanumanthappa** et. al. **(1999)** result of the experiments conducted on supplementation of feed additives in the feeds of different species indicated that incorporating of additives at a very low level was found beneficial and fish of desired size could be reared in a shorter period of time with less of feed. Fish feeds with fishmeal base diets (39-40% proteins) containing feed additives (Licamin) showed higher weight gain than control diet.

From the point of view of profitable aquaculture inclusion of feed additives proved beneficial and economically feasible when the resultant fish production is taken into account.

Sharma and Mehta (1999) in their investigation found that rice bran, oil cake could be replaced successfully by foxtail millet without any disadvantageous reduction in weight of fish.

According to **Sehgal and Sehgal (2000)** in a semi-intensive farming system, the dietary protein level (10 to 40%) did not affect fish growth until the standing crop reached 600 kg/ha, when 20% protein diet resulted in maximum growth. The 30% protein diet resulted in maximum growth at standing crop of upto 1600 kg/ha. At standing crop higher than 1600 kg/ha the 40% protein diet resulted in maximum growth. Increase in standing crop of fish corresponds with decrease in the availability of natural food. This, therefore, suggested that formulation of a supplementary feed is dependent upon the standing crop of the fish and the consequent availability of natural food. Thus most important issues is to develop economical and environment friendly supplementary feeds and efficient feeding strategies.

2.1.5 <u>**Manure and Fertiliser:**</u>

Mortimer (1954) in his study has shown that carp production in fertilised ponds was 2 to 10 times higher than that of un-fertilised ponds in temperate region.

Lin (1970) reported that calcium superphosphate @ 2,000 kg/ha gave the best results in boosting production of fish in fresh water ponds in Taiwan especially that of silver carp.

Saha <u>et</u>. <u>al</u>. (1975) concluded that high fish production can be achieved by manuring the ponds with slightly acidic to neutral soils with urea and alkaline soils with ammonium sulphate.

Banerjee <u>et</u>. <u>al</u>. (1979) worked on poultry dropping as manure which increase productivity of pond.

Sharma <u>et</u>. <u>al</u>. (1979) observed that dropping from 100 to 150 birds (duck) (10 to 16 t/year), fed on concentrated poultry feed were sufficient to fertilise 1 ha water area. A sustained high plankton production was obtained in the pond resulting in fish production of the order of 4.3 t/ha/year.

Sarkar (1983) found that chemical fertilizers hold great promise in increasing the production

capacity of fishpond. Some such as urea, ammonium sulphate and ammonium sulphate nitrate have been shown to enhance fish survival and yield in ponds.

The studies of **Das (1988)** have clearly shows that available-N has a distinct role on the growth and production of *Clarius*.

According to **Rout and Tripathi (1988)**, organic manure, inorganic fertilisers, supplementary feed and pond size has positive correlation with fish yield, except lime.

Debeljak et. al. (1990) suggested the fertilizer application at biweekly interval is more economical.

Jana and Sahu (1994) demonstrated that net primary production of water as well as the growth of *Cirrhinus mrigala* were distinctly higher (23 to 76%) in the weekly application of Mussoorie phosphate rock than those for fortnightly and monthly application.

Sarkar (1996) strongly advocate the need for caution in the long-term application of nitrogen fertilisers and nitrogen at high rates in culture ponds.

2.1.6 Lime:

According to **Bose et. al. (1991)** liming is routinely done during pond preparation and as a part

of pond maintenance, since it has a favourable action on the biological factors of production and health of fish.

According to **Miah et. al. (1996)**, Lime showed negative correlation with fish yield. Among the inputs supplementary feed, organic manure and inorganic fertilisers had significant effect on fish yield in farmers' pond.

2.2 COMMUNITY FISH FARMING :

In this small section, inferences of different studies regarding community fish farming have been presented.

Tripathi et. al. (1982) described concept of community fish farming in workshop on development of Inland Fisheries in Orissa through institutional finance.

Pokharel (1987) attempted to analyse the nature and status of community fish farming (C.F.F.) in the Tarai region of Nepal with special reference to Bhawanipur and Hanuman Nagar village panchayats. The overall objective of the study was to trace a broad picture of C.F.F., which has been practised by local farmers for a long time. The study reveals that fish farming is characterised by low input and low output.

Sugunan (1999) found that community water bodies mostly found in Zimbabwe, the north eastern Thailand, the north-eastern Brazil and some parts of Mexico, these are the most loosely organised fishery system where the common property norm and open access system often play a negative role in management. Many community reservoirs are legacies of the past and their fishery practices are deeply rooted to the customs and traditional values of local community. Recent efforts made in Zimbabwe and Brazil to develop a new participatory management system are worth examining. The attempt is basically to blend concept of equitable sharing of natural resources with that of conservation and sustainable development. In the process, the spirit of equity and democratic functioning are sought to be infused into the members of the community.

Radheshyam et. al. (2000) stated that community based aquaculture essentially offers enormous scope for commercial production of fish and also an easy access to fish for consumptive household needs. The impact of community aqua farming on fish consumption by rural poor was investigated, involving 65 household during two successive years. First year -

Before Community based Aquaculture (BCA) and second year - During Community based Aquaculture (DCA). The study revealed that overall BCA per capita fish consumption from the entire source was 12.07 kg, whereas DCA per capita fish consumption was 26.24 kg exhibiting 117.4% increase. Community base aquaculture made a significant impact in ensuring the rural farmers' access to food fish in terms of quantity, quality and safety and thus providing food security.

2.3 SOCIO-ECONOMIC CONDITION:

Results of different studies regarding socio-economic condition are grouped in this section.

Kalawar (1981 a & b) carried out work on coastal and rural fisheries and their livelihood of fishermen of Thane district.

Valiakandalhil and Kurian (1981) studied the Socio-economic condition of fishermen of Kerala.

Drews (1982) worked on the role and status of fisher women of Tamil Nadu.

According to **Gadhia et. al. (1999)** the fisher community in area around Kakrapar Atomic Power Station, are part of the lower strata of the Society. They are generally poor and are in a disadvantageous position in the society because of their economic

backwardness, illiteracy and insignificant political attention and social institution, they remain indebted to private money lenders who advance money to meet their professional and other expenses.

Sadangi et. al. (1999) conducted a survey of three villages around Chilka of Orissa. The pilot study has also recalled that fishermen who come under scheduled caste category predominantly inhabit all the villages. The highest percentage (60%) of fisher women is found in the age group of 35-45. Illiteracy is rampant among the fisher women, but 10% of the young fisher women have some primary education. They have a high level of credit seeking behaviour and about 80% of them are below poverty line. Discussions revealed that 10% of the fisher women could mobilise finance for their professional activities from non-institutional sources, like private moneylenders against different kinds of mortgages. It is seen that most of them are primarily involved in fishery activities (Fishing +fish trading 60% and aquaculture + fish trading 40%).

Meeran (2000) worked on socio-economic characteristics of fish farmers in Thanjavur district of Tamil Nadu. The study revealed that the fish farmers

were literate with a majority belonging to young to middle age groups and backward community. They practised fish farming as primary/secondary occupations in addition to other occupation. Majority of farms ranged from 0.4 to 3 ha in size with bore wells as the major source of water. Direct sales to the public and vendors at the farm gate were the preferred marketing methods.

2.4 ROLE OF FISH FARMERS' DEVELOPMENT AGENCY (FFDA):

In this section those studies are presented which particularly refer to role of fish farmers' development agency (F.F.D.A.)

Rao (1980) reported that F.F.D.A. was introduced as a centrally sponsored scheme by the Govt. of India during the Firth five year plan period for promoting intensive fresh water and brackish water fish culture. It functions as an autonomous body co-ordinating the role and functions of the various Govt. departments, Financing Institutes and fish farmers in an integrated manner. The agency provides subsidies offered by the Government under the project and arranges credit from the Financial Institutes.

Wadhwani & Broadway (1988) studied the achievements of F.F.D.As in Allahabad, U.P. The F.F.D.A. was

established in 1978, with the aim of developing water resources in rural areas to improve the nutritional levels of the poor and generate employment. By the end of 1985-86, 775 ponds had been leased out, of which 60% incorporated improved practice and 40% did not improve due to lack of funds and the failure to secure loans for production and improvement costs.

Chauhan (1991) in his paper "the birth and growth of Fish Farmer Development Agency" reported that establishment of F.F.D.A. in 5th five year plan, with the aim of extension of fish farming by utilising low lying areas and other unsuitable for agriculture has increased national average fish production from 582 kg/ha/yr. in 1979-80 to 1865 kg/ ha/yr. in 1989-90.

Jhingran (1991) reported that F.F.D.A. function as autonomous bodies with a district as the unit base. The F.F.D.A. meets the basic needs of the fish farmers in respect of (i) technical support (ii) extension support and (iii) financial support.

About 120,000 hectares of village ponds lying fallow have been brought under fish culture and about 90,000 farmers trained in composite fish culture by the 184 F.F.D.As (upto 1986).

Progress of fish farmers development agency in U.P. upto March 1986 is noted in his study where total number of F.F.D.As in Uttar Pradesh was 28, 15,000 ha water area brought under fish culture and 13,750 number of fish farmers trained.

Dwivedi (1994) reported that the Ministry of Agriculture (Fisheries Division) has liberalised support to fresh water and brackish water through F.F.D.A's subsidy has been increased from Rs. 20,000 to Rs. 30,000 a hectare with a maximum of Rs. 1.0 Lakh per unit.

Fish Farmers' Development Agency supports extensive aquaculture in village ponds and other remote areas. The average fish production is around 1,900 kg/ha/yr.

Singh (1998) in "Uttar Pradesh Newsletter" described role of F.F.D.As and narrated that at present the state government alone with F.F.D.As is providing following facilities to fish-culturists:

- ❖ Granting lease of ponds for duration of ten years for fish farming to those from fisher community;
- ❖ Providing loan of Rs. 82,000/ha with 25% subsidy for renovation of ponds to fish farmers;

- Providing short-term training programme on technical aspects of fish culture to fish farmers for a duration of 15 days and to provide training allowance at Rs. 25/day/ farmer;
- Organising provision of loans at the rate of Rs. 12,000 per ha through nationalised banks to meet cost of first year inputs required for fish farming with 25% subsidy;
- Arranging supply of quality fish seed to fish farmers;
- Providing water and soil quality testing facilities free of cost to fish farmers; and
- Extending technical assistance to fish farmers from time to time.

According to **Ninawe (1999)** the fish farmers' development agencies (F.F.D.As) have played an important role in creating awareness among the fish farming community to promote integrated composite fish farming on scientific line. As on today, there are 414 F.F.D.As covering in 2.87 Lakh ha of water spread area under fish culture.

2.5 ATTITUDE:

As the heading implies, studies of scholars who have particularly written about 'attitude' are given in this section.

Dhillon (1964) in his study "Attitude of gram Sevikas" stated that generally they have a slightly favourable attitude towards the community development programme. As a whole every third gram Sevika possessed unfavourable attitude, whereas every tenth individual had not developed any definite attitude towards the programme.

Jha and Singh (1973) found that the attitude of farmers towards high yielding varieties programme to a great extent influence the nature and extent of their participation in the green revolution.

Makkar, S.L. and Sohal, T.S. (1974) in their study "Attitude of farmers towards soil testing" observed that respondents of younger age, higher education and operating medium size of land holdings carried more favourable attitude towards soil testing then others.

Balasubramanian, U.A. (1980) in his study "A study of factors affecting adoption of blue green algae technology by rice growers of Walajabad Block of Chegleput District of Tamil Nadu" found that early adopters had high favourable attitudes towards innovation.

Singh, R. (1987) reported that the majority of milk producing members had undecided attitude towards member of Pradeshik Co-operative Societies.

Krishnraj and Dubey (1990) reported that members of the societies had favourable attitude towards the members of Pradeshik Co-operative societies.

Singh, S. (1992) reported that members attitude was found to be more favourable than non-members of village dairy co-operatives.

2.6 FISH FARMING AND RURAL EMPLOYMENT:

Results of different studies regarding fish farming and employment are grouped in this section:

Rabanal & Delmendo (1980) in their study concluded that aquaculture as an industry. It is inherently manpower intensive, but not much power selective. Therefore, it can be used to advantage in many populous developing countries where family labour, regardless of sex or age, can be utilised. This small-scale family venture in aquaculture can, therefore, be a good source of additional income.

Fermin (1983) in his paper "The introduction of integrated backyard fish pond in low land cavity" described that there is bright prospect for back yard fishpond operations in terms of providing fish

protein, additional income and employment to the farm family. Fishpond operation can very well fit activity of small farmers.

According to **Thakur *et. al.* (1988)** the activity of aquaculture in back yard pond generated income and provided employment for the rural women folk within the village.

Radheshyam (1998) reported that adoption of fry and fingerling production technology in villages is techno-economically viable for rural poor. The adoption of upgraded technology in rural area not only ensures production of adequate quantities of quality seed within easy reach of the farmers but it also generates better income and employment.

Bhanot *et. al.* (1999) in their article "Fishery technologies for women" described that aquaculture is the emerging fisheries sector where women can benefit from the technology leading to their empowerment. Aquaculture is the source of self-employment in rural areas.

According to **Gopa Kumar (1999)** Fish farming in India offers an income generating highly remunerative profession for youth. A 1 ha fish farm can give an

average income of Rs. 5,000/month in case of carp culture and Rs. 13,300/month in case of catfish.

For youth, a fishery is an expanding area of employment generation. It is also found that on an average for every one youth employed in fishing operation 4 additional persons are getting support employment through ancillary industry.

Vardia (1999) reported that small water bodies (village ponds) offer immense scope and potential for generating additional income and employment to an individual farmer, to a community.

Bhatta et. al. (2000) organised a study in Karnataka state. The study reveals that there is a vast scope of carp fish farming for realising additional income and employment with minimum negative externality.

2.7 ECONOMICS OF FISH FARMING:

In this section, the results of the studies of those scholars have been given who have evaluated the economics of fish farming.

Dandyal and Singh (1968) studied benefit cost ratio in fish culture and opined that fish cultivation was profitable to the extent of Rs. 2,300 per annum per acre under systematic cultivation. The

profit margin of Rs. 349.56 was relatively low in natural fishery because of seasonal nature.

Webber (1973) in his study concluded that excessive inputs (fertilizer) to the ponds, which are not utilised by the fish, raise the expenditure of the experiment and also add to the high metabolic load of the ponds.

Sinha (1975) noted that an intimate relationship between the input and out put (the fish) prominent among which are the feed and fertilisers which account for the greatest part of the expenditure.

Bakar and Ashad (1979) indicated that small sized ponds are sufficient to generate supplementary income for farmers and ponds on a large scale could be used as a major occupation. Whatever the method of pond preparation, wages constituted more than 65 percent of total costs, while equipment and material constitute 25% and 10% respectively. Further more, increasing the size of ponds led to an increase in development costs by only 50%.

Govind et. al. (1983) reported that cost of production ranged from Rs. 0.34 to Rs. 2.49 per kg in composite fish culture around Bangalore during 1981.

Tripathi (1984) stated that supplementary feed is the major cost component to the extent of 50-70% of total cost.

Lakshmanan et. al. **(1985)** carried out an experiment in a pond (0.4 ha)belonging to less income group villagers at Pubaṣasan near Dhauli in 1979. The management practices including liming, fertilising the ponds with a mixed fertiliser and cowdung and feeding the fish with groundnut oil cake and rice polish. The harvesting the bulk of the stock through netting yielded a gross production of 2,000 kg/ha/6 months. The cost of production was Rs. 2.72/ kg of fish harvested.

Moula et. al. **(1986)** evaluated the economics of fish culture under different pond size in Bangladesh.

Bose et. al. **(1989)** observed that gross return per hectare in case of large fish farmer (1-2 ha pond) is much lower than the small fish farmer (> 1 ha). The reason to be given to this fact is that the small fish farmers sell their catch on the spot and get a high return per kg. Medium and large size fish farmers sell their produce through the agent by auction and pay commission resulting in lower return per kg.

Gangopadhyay and Giri (1990) had reported that fish production was more remunerative than crop production and was more capital intensive.

Suresh <u>et</u>. <u>al</u>. (1990) made a survey on "An economic analysis of productivity in fish water aquaculture in Madurai District" and found that level of fish production is generally low owing to sub optimal use of various inputs like seed, feed, fertilizer, labour management.

Majumdar and Haque (1992) have attempted a study in Nadia district of West Bengal to assess the relative cost and return from pond and field crop enterprises. The study indicates that the average cost and returns per hectare from fish production were Rs. 20,245.22 and Rs. 30,173.50 respectively and from field crop production were Rs. 10,774.94 and Rs. 12,195.60 respectively.

The return from ponds and field enterprises were positively and significantly correlated with the size of pond and operated agricultural land. The results indicate that the pond crop cultivation is more profitable than that of field crop cultivation.

Jaynaman and Varadarajan (1993) analysed the economic of carp culture in Thanjavur district of

Tamil Nadu. Report shows that farmers get only a net return of Rs. 2594/ha/yr. with an average production of 888.4 kg/ha/yr. Cost per kg of fish production was little higher for large fish farmers than small farmers.

Suresh ***et. al.*** **(1993)** in their paper entitled "Economic analysis of fresh water fish culture in Kanyakumari district" has noted that farmers of Kanyakumari district of Tamil Nadu get only a net return of Rs. 2,614/ha/yr. with an average production of 920 kg/ha/yr.

Anil ***et. al.*** **(1996)** indicated that the major component of cost in case of culture fishery was the harvesting expenses which had a share of 32% of the total cost. The profit margin in capture fishery was more than those in culture fishing. It was found that the fishermen were not following the recommended practices in fish culture.

Singh & Sharma (1998) observed that total variable cost alone accounted for more than 85% of total cost in fish production. It was higher for large farmers (<1 ha) (Rs. 3625) compared to small farmers (>1 ha)(Rs. 2175). Among different variable cost items, the expenditure (per ha) on feed was the

highest (23.16%) followed by seed (23.14%) and manures/fertilisers (20.33%) for small farmers, whereas for large farmers it was much higher for feed (59.38%), followed by lime (13.73%) and seed (4.26%). Net return was higher for large farmers (Rs. 59,745 per ha) compared to small farmers (Rs. 41,910/ha). The production cost per kg of fish was Rs. 10.28 for large farmers whereas it was Rs. 9.24 for small farmers.

Singh & Swain (1998) had conducted study on semi-intensive carp culture Regional Research Centre at a village in Ludhiana in a privately owned large (5 ha) pond during 1997-98. A production of 8 tonnes/ha has been achieved through phased manuring, bag feeding, bottom ranking, addition of fresh bore well water and stock manipulation.

Total expenditure on various inputs e.g. seed, feed, fuel, fertilisers and labour etc. was Rs. 0.439 million. An amount of Rs. 1.088 million was realised through sale of 40.30 tonnes of fish @ Rs. 2700 / tonne. Such a gross profit of Rs. 0.649 million was made from 5 ha (Rs. 0.130 million / ha) through semi intensive culture of carps.

2.8 PROBLEMS IN FISH CULTURE :

Results of studies hinting about the problems in fish culture are given in this section. Being introduced as new farming system, fish farmers are facing several new problems to adopt the scientific modern system. These problems are mainly categorised as physical, economical and social problem.

Chakravorty (1968) reached the conclusion that in higher number of shareholders the less is the attention paid to the tanks as they faced with various maintenance and management problems. The shareholders, with small shares were hardly ready to spend for the development of tank although their expenditure was also proportionately small.

Ranadhir et. al. **(1979)** stated in his paper non availability of fish seed of exotic carps in adequate numbers at reasonable price and in specific times poses a serious constraint in rural areas.

Sinha and Ranadhir (1980) pointed out certain constraints in the development of small-scale fresh water fish culture. The constraints are grouped into six major sections, viz. Basic inputs, Social constraints, Legal constraints, Financial

constraints, Extension gap and Lack of infra-structural facilities.

Haque (1981) developed scale for measurement of problems as perceived by the farmer during his Ph.D. thesis research work.

Haque and Ray (1983) reported that adequate exposure to carp culture technology is important problem.

Das <u>et</u>. <u>al</u>. (1984) in their study came to a conclusion that extension gap as serious problem in development in aquaculture.

Rehman and Ali (1986) observed that average size of ponds in Bangladesh was too small for lucrative fish culture. Utilisation of fishery credit was not satisfactory, surplus fish were disposed of to local fishermen, non availability of good quality of fries (fish seed) from Government fish farms and lack of technical knowledge were major constraints on the pond owner.

Ameen (1987) described the major constraints upon pond fish culture in Bangladesh and include poaching, scarcity of piscicide, quality fry and credit, multiple pond use and ownership, over flooding and inadequate marketing.

Bhaumik **et. al. (1987)** observed that non availability of credit is most important problem in fish culture in West Bengal.

Misra (1987) in his book assessed the operational features of fresh water ponds and tanks in the rural areas of Birbhum and Murshidabad districts of West Bengal; socio-economic factors that impede the development of fish farming and the performance of relevant Government policies. It is noted that (1) the levels of production and productivity are not adequate; (2) new technology has failed to produce substantial results and (3) Production constraints included plurality of owner-ship of tanks and ponds, lack of quality fish seed, shortage of investment capital, inadequate extension network, poaching, deliberate poisoning and inadequate organised marketing facilities.

Bhaumik **et. al. (1988)** conducted a survey in ten districts in West Bengal to identify the problem associated with the culture of exotic carps as perceived by the farmer. The study revealed non availability of credit (33.2%), lack of knowledge about the technology (16.7%), non availability of exotic carp seeds (16%), lower market (8.9%), non

availability of aquatic vegetation for grass carp (7%), poaching (6.9%), lesser consumer preference (4.2%), poisoning of ponds (8.6%) and non availability of water bodies (3.5%) as the chief problems in the order of priority. The farmers also suggested measures like provision of credit, more exposure to modern technology, supply of exotic carp seed, production of fodder for grass carp, marketing through organised sector and control of poaching and poisoning of the ponds for more effective diffusion of the technology.

Radheshyam et. al. **(1991)** were convinced that wide shade thrown by tree over ponds render the pond water unproductive. Dropping of leaf litter makes the environment un-conducive for thriving of carps and the organisms that serve as food for the carps. Shading by tree is common problem in rural pond.

Gaur and Khan (1996) described pisiculture plays important role in the socio-economic condition of tribal communities of N.E. region, but due to variety of problems, the region is not self sufficient in meeting total requirement of fish. Prime factors include non-availability of suitable ponds, seeds, funds, etc.

Misra (1996) made a survey on transfer of technology on pisiculture in Birbhum district of West Bengal. Study reveals that the lack of finance was recognised as production disincentive by all operators. The operators also considered the non assurance of supply of quality fish seed at reasonable prices at the time of stocking as an important factor. Multiple ownership also emerged as a problem. High price spread and non retention of water throughout the year are also responsible for non adoption of modern practices.

Srivastava ***et. al*****. (1996)** pointed out seepage & percolation loss of water from fish pond has been a major problem in arid and semi arid regions. This is mainly due to low clay content, deeper water table and calcarious nature of soil. So there is a need to come out with measures which not only reduce the seepage rate but also maintain natural conditions.

Keeping this in view, an experiment was conducted using Bentonite, naturally occurring montmorrilonite clay, in small amount (5-10%) along with local clay and local soil. Lining of 15 cm puddled mixture of three components was able to reduce the water loss to manageable level in small pits. The

water loss / day was reduced to below 1 cm/day from 40 cm/day.

De and Saha (2000) conducted a study in Basudeipur, Orissa to identify the problems related to fish farming through farmer participation. Six key informants and a random sample of thirty farmers were selected for the purpose. Eight problems were identified, three of which were technology-related and the rest were infrastructural problems and suggestions were given.

CHAPTER III

METHODOLOGY

This chapter deals with sampling design for primary data collection and various techniques used for data analysis besides defining certain basic terminology and concepts. The presentation in this chapter has been made in the following order:

3.1 Data - their sources, method of collection and tabulation, and analysis;

3.2 Socio-economic status;

3.3 Development of scale to measure attitude;

3.4 Economic development; and

3.5 Development of scale to identify the problems.

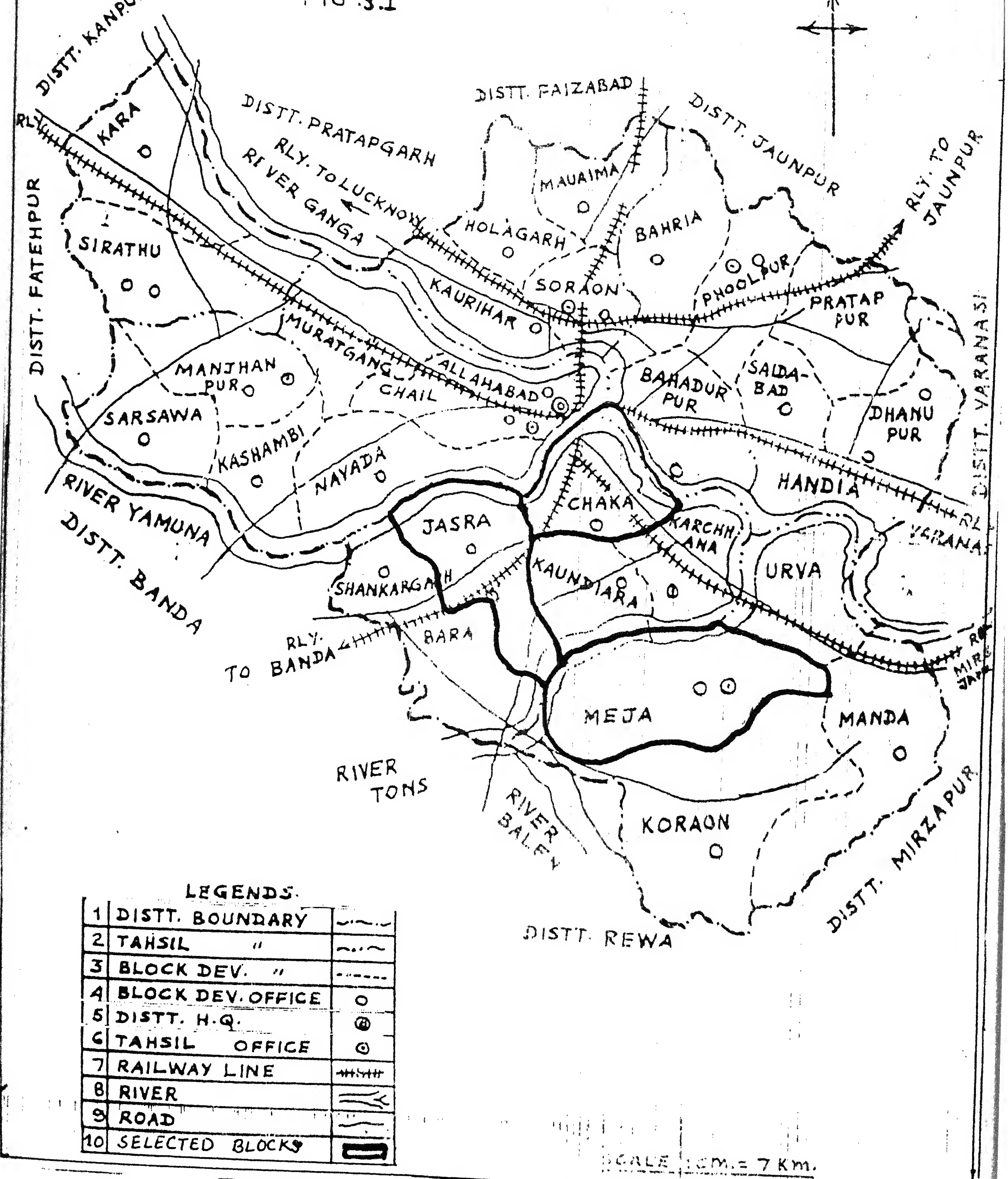
3.1 DATA-THEIR SOURCES, METHOD OF COLLECTION, TABULATION AND ANALYSIS:

3.1.1 Primary data:

Level of agricultural production and nature of cultivation practices followed, varied with geographic location, market accessibility, education and technical know-how, and traditional nature of the population. Therefore, primary data, such as cost of cultivation of fish under study, input-output behaviour in the fish production process, adoption of

MAP OF DISTT. ALLAHABAD

FIG 3.1



modern fish farming techniques, per hectare productivity of fish in the Jamunapar region, were collected.

3.1.1.1 Choice of study area:

The study area, i.e. the southern part of the Allahabad district, known as Jamunapar, is partly hilly and agriculturally backward, but in case of fish farming, it is quite important. Maximum number of fish farmers (community ponds) existed in the region. Two fish seed hatcheries are located in the study area of the district - one in Meja block and another mini hatchery in Jasra block. Two fish rearing centres are located in Koraon and Meja. Agro-climatic conditions, socio-economic status of this area is homogenous (Fig. 3.1).

3.1.1.2 Size of the Sample:

Out of nine blocks of Jamunapar region of Allahabad district, from 3 Tehsil, three blocks namely Chaka (Karchhana Tehsil), Jasra (Bara Tehsil) and Meja (Meja Tehsil) were selected for the study. The total 46 villages were selected. Total respondents were 120 consisting 64 small fish farmers

(pond size below 1 ha) and 56 large fish farmers (pond size above 1 ha) (Table 3.1).

3.1.1.3 Sample Techniques:

A multistage random sampling technique was adopted to draw the ultimate sample of 120 fish farmers from 3 blocks of Jamunapar region in Allahabad district where community fish farming practice took place. Fish cultivation practices in this region varies from primitive traditional (extensive fish farming) to the modern technological farming system (semi-intensive fish farming). Intensive fish farming is lacking in this region.

Table 3.1 List of selected villages along with community ponds in the study area

(Pond Area in ha)

Sl. No.	Block/Village	Small Pond		Large Pond		Total	
		No.	Area	No.	Area	No.	Area
	CHAKA						
1.	Amlia	1	0.75	-	-	1	0.75
2.	Balapur	2	1.55	-	-	2	1.55
3.	Dandupur	1	0.56	1	1.25	2	1.81
4.	Champatpur	1	0.80	1	1.50	2	2.30
5.	Pipirsa	1	0.80	-	-	1	0.80
6.	Bhadra	2	0.75	-	-	2	0.75
7.	Palpur	1	0.85	-	-	1	0.85
8.	Pura khagan	-	-	1	2.50	1	2.50
9.	Bagbana	2	1.25	1	1.25	3	2.50
10.	Uvari	-	-	1	1.35	1	1.35
11.	Nibi	2	1.65	-	-	2	1.65
12.	Babupur	1	0.50	-	-	1	0.50
13.	Sarangapur	-	-	1	1.00	1	1.00

Cont....

Cont….

Sl. No.	Block/Village	Small Pond		Large Pond		Total	
		No.	Area	No.	Area	No.	Area
14.	Chack Hidiydulla	1	0.35	-	-	1	0.35
15.	Chaka	1	0.25	-	-	1	0.25
16.	Bongi	1	0.90	-	-	1	0.90
17.	Hathigan	4	2.80	-	-	4	2.80
	JASRA						
1.	Tikri kala	3	2.25	7	8.25	10	10.50
2.	Tatarganj	1	0.90	-	-	1	0.90
3.	Chilla	-	-	2	3.50	2	3.50
4.	Sujaura	-	-	1	1.00	1	1.00
5.	Barakhas	7	4.50	6	6.75	13	11.25
6.	Belamunda	-	-	2	2.50	2	2.50
7.	Chatahara	1	0.80	-	-	1	0.80
8.	Sandwa	2	1.40	-	-	2	1.40
9.	Kanthi	-	-	6	8.75	6	8.75
10.	Rigwa	2	1.10	-	-	2	1.10
11.	Budhawa	2	1.55	-	-	2	1.55
12.	Tikri Taluka	2	0.90	-	-	2	0.90
13.	Atarshuya	2	1.00	2	3.00	4	4.00
14.	Basharathara	1	0.45	-	-	1	0.45
15.	Gohania	2	0.75	-	-	2	0.75
	MEJA						
1.	Meja Road	3	2.60	4	5.39	7	7.99
2.	Basaha	1	0.90	-	-	1	0.90
3.	Badhuwa	1	0.85	-	-	1	0.85
4.	Sirsa	1	0.82	2	3.75	3	4.57
5.	Patchora	3	2.13	3	9.27	6	11.40
6.	Khiri	2	1.35	-	-	2	1.35
7.	Sirhir	4	3.20	5	18.75	9	21.95
8.	Jarhara	-	-	1	1.25	1	1.25
9.	Pusihar	-	-	1	1.25	1	1.25
10.	Tendua Khurd	-	-	1	1.34	1	1.34
11.	Saray Khand	-	-	1	1.75	1	1.75
12.	Patahara	-	-	3	5.35	3	5.35
13.	Etwa Khurd	1	0.95	-	-	1	0.95
14.	Badraha	2	1.25	3	7.25	5	8.50
46	**TOTAL**	**64**	**43.41**	**56**	**97.95**	**120**	**141.36**
	Average size		**0.68**		**1.75**		**1.18**

Source: Personal Investigation

Table 3.2 List of selected villages along with community ponds in the study area

(Area in ha)

Sl. No.	Clusters	Villages in Cluster	Total No.of ponds		Total Water Area	
			Small	Large	Small	Large
1.	Chaka I	Dandupur, Amlia, Babupur, Champatpur, Piprsa, Bhadra, Palpur, Sarangapur, Purakhagan, Bagbana, Chaka	10	5	6.26	7.50
2.	Chaka II	Hathigaon, Nibi, Balapur, Chak Hidiy-dulla, Bongi	11	1	7.50	1.35
3.	Jasra I	Tatarganj, Chilla, Sujauna, Chatihara, Basahara, Belamundi	3	5	2.15	7.00
4.	Jasra II	Sandwa, Kanthi, Tikari Taluka, Atarshuya, Gahauni, Budhawan	10	8	5.60	11.75
5.	Jasra III	Tikuri kala, Bara khash, Rigwa	12	13	7.85	15.00
6.	Meja I	Meja Road, Tendua Khurd, Khiri, Sishir, Jarhar, Sirsa	10	13	7.97	30.48
7.	Meja II	Saray Khand, Pusihar, Badhawa	1	2	0.85	3.00
8.	Meja III	Etwa Khurd, Patchora, Patahara, Basaha, Badraha	7	9	5.23	21.87

Source : Survey

3.1.1.4 Steps of sampling:

i. First Step: A list of fish farmers who are engaged in community fish farming was obtained from Fish Farmers' Development Agency (F.F.D.A.). From this list, three blocks - one from each Tehsil, where number of fish farmers practising C.F.F. System were selected.

ii. Second Step: In this step, list of villages was prepared in which community fish farming system is in practice. It was observed that in one village one community pond is located. In this case, village cluster was prepared considering their locational proximity as well as cultural homogeneity (Table 3.2)

iii. Final step: Eight clusters were selected randomly, two from Chaka block, three from Jasra and Meja block each (Table 3.2) and total respondents were classified into two groups:

A. Small fish farmers having pond below 1 ha; and

B. Large fish farmers having pond above 1 ha in size.

Table 3.3 Lead distance matrix (in km)

Cluster	Alld. City	Chaka I	Chaka II	Jasra I	Jasra II	Jasra III	Meja I	Meja II	Meja III
Alld. City	0	14	16	26	32	30	43	58	63
Chaka I		0	5	13	22	18	50	65	70
Chaka II			0	34	36	31	47	54	42
Jasra I				0	10	12	62	77	82
Jasra II					0	22	72	87	92
Jasra III						0	68	83	88
Meja I							0	15	20
Meja II								0	25
Meja III									0

Source : Survey

3.1.1.5 Development of Interview Schedule:

A structured schedule was prepared in order to conduct the survey of C.F.F., which comprises of five parts:

(1) Household schedule;

(2) Technical details regarding fish farming;

(3) Attitude towards fish farming;

(4) Economics of community fish farming; and

(5) Problems in fish farming.

The schedule was pre-tested on a group of 15 fish farmers, with an idea to modify, add or delete the items of the schedule against ambiguity (Appendix 6).

3.1.1.6 Period of enquiry:

The data pertaining to selected farmers were obtained during the period December 1998 to July 1999 through help of schedules and by the direct personal enquiries survey method.

3.1.2 Secondary Data:

Secondary data included in the study were:

i. Renovation of existing ponds;

ii. Construction of new ponds;

iii. Indian capture fisheries and fresh water aquaculture resources;

iv. Resources of U.P. and Allahabad district;

v. Fish production of U.P. and India;

vi. Total fish seed production in U.P.;

vii. Annual growth rate; and

viii. Potential production data, etc.

Major sources of secondary data were:

1. Various reports/bulletins published/unpublished from the state department of fisheries, CIFA (Central Inland Freshwater Aquaculture), CICFRI(Central Inland Capture Fishery Research Institute), FFDA (Fish Farmers' Development Agency); and
2. Statistical reports of Allahabad, NABARD's report.

3.1.3 Reference year of the study:

It was observed that in some cases, secondary information was available upto 1998-99 but in most of the cases, data were available upto 1997-98 only. So, the reference period for the study was taken as 1997-98.

3.1.4 Tabulation, Analysis and Interpretation Of Data:

The data thus collected were transferred on tabulation sheets. They were then analysed and interpreted in the light of the objectives and hypothesis set-up for this study.

3.1.4.1 The use of statistical tests in research:

Several different statistical methods have been used in this study. In the broad framework, both descriptive and inferential statistics were employed in the analysis of qualitative and quantitative data and interpretation of findings have been made accordingly. The procedure for rejecting and not rejecting hypothesis is as follows:

1. State the null hypothesis;
2. Choose a statistical test;
3. Specify significance level on the sample size;
4. Find the sampling distribution of statistical tests; and
5. Compute the value of statistical tests using the data obtained from the sample. If that value is in the region of rejection, the decision was to reject the null hypothesis. If that value is

outside the region of rejection, the decision is that the null hypothesis could not be rejected at the chosen level of significance.

Descriptive Statistics:

The statistical methods, which are used in describing the distribution of a characteristic among the series of varying units, are called descriptive statistics. These methods describe distribution of characteristics of particular group of units at a particular time.

Inferential Statistics:

This deals with the analysis of several aspects of the association or relationship between the distribution of two or more characteristics among the same group of units. Thus, they consciously describe the existing directions, degree and nature of association between the two or more characteristics enumerated or measured.

There are two statistical models employed in inferential statistics parametric and non-parametric. A parametric statistical test is a test whose model does not specify conditions about the parameters of the population from which the scale was drawn.

However, most parametric tests apply to data in an ordinal scale and some apply also to data in a nominal scale. Non-parametric tests are being increasingly used in behavioural sciences because the data to be dealt with are mostly ordinal or nominal and it is very difficult, if not impossible, to meet the stringent assumption of the parametric tests.

3.1.4.2 **Statistical tests used:**

1. **The Mann - Whitney 'U' test:**

The non-parametric test was used to test the validity of attitude scales. The validity of the test was calculated by comparing the scores of small and large fish farmers. The Mann Whitney U-Test yielded a significant result at 0.05 level of significance. It was found to be 16.18. The small fish farmers scored significantly higher than large fish farmers. Since the difference on this test was significant in the direction, which one would logically expect, therefore, the scale was considered valid. From the test, it was concluded that the scale was valid for use. The following formula for Mann-Whitney U-Test was used:

$$Z = \frac{U - (n_1 n_2)/2}{\sqrt{\frac{(n_1)(n_2)(n_1 + n_2)}{12}}}$$

Where

n_1 = The number of smaller sample

n_2 = The number of larger sample

U = Sum of ranks of n_1 sample

2. **The x^2 test for two independent samples:**

This test was used to find out if there were any significant different between small and large fish farmers as regards caste, education, land holding and the following formula was used:

$$x^2 = \frac{\sum(O-E)^2}{E}$$

Where O = Observed frequency of respondents in that class

E = Expected frequency of respondents in that class

$\sum$ = Summation taken over all the class

3. **'Z' Test for larger samples:**

To test the hypothesis, 'Z' test was used because of the larger sample size this test was used to find out if there was any significant difference between socio-economic status and attitude of small

and large fish farmers separately. The following formula was used:

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{(SD_1)^2/n_1 + (SD_2)^2/n_2}}$$

Where $\bar{X}_1$ = Mean of the first sample;

$\bar{X}_2$ = Mean of the second sample;

$(SD_1)^2$ = Square of standard deviation of first sample;

$(SD_2)^2$ = Square of standard deviation of second sample;

n_1 = No. of observations in first sample; and

n_2 = No. of observations in second sample

4. <u>Pearson Product Moment Correlation Coefficient</u>:

The spearman Brown split-half reliability method was applied to the responses of 64 small and 56 large fish farmers. The sentences in each scored paper were split-half into two halves on the basis of odd and even numbers and their scores added up. Thus from every single paper, two sets of scores were obtained. The Pearson product Moment Correlation Co-efficient

was compared between two sets of scores. The following formula for 'r' was used:

$$r = \frac{N\sum xy - (\sum x)\ (\sum y)}{\sqrt{\{N \times \sum(x)^2 - (\sum x)^2\}\ \{N \times \sum(y)^2 - (\sum y)\}^2}}$$

Where N = Total number

$\sum x$ = Sum of odd scores of respondents

$\sum y$ = Sum of even scores of respondents

$\sum xy$ = Sum of products of odd scores and of even scores

x^2 = Square of odd scores

y^2 = Square of mean scores

5. <u>Linkert Technique (Technique of summated rating</u>:

It was used to evaluate an individual statement and attitude. Highest total scores and lowest total scores were segregated from fourteen of the subjects. It was assumed that two groups would provide criterion groups in items of which to evaluate an individual statement.

3.2 SOCIO ECONOMIC STATUS:

The scale developed by Trivedi and Udai Pareek (1964) was used to measure the socio-economic status.

3.3 DEVELOPMENT OF SCALE TO MEASURE ATTITUDE OF FISH FARMERS TOWARDS COMMUNITY FISH FARMING SYSTEM:

Thurstone (1946) defined an attitude as "the degree of positive or negative effect associated with some psychological objects". In the literature of psychology, the terms effect and feeling are used interchangeably. An individual who has associated positive effect or feeling with some psychological object is said to like that object or to have a favourable attitude towards the object. An individual who has associated negative effect with the same psychological object would be said to dislike that object or to have an unfavourable attitude towards the object.

In India's concern for raising agricultural production and socio-economic development of villages, various attitudinal problems are coming in the way. One reason for the poverty and poor adoption of farm technology is unfavourable attitude of farmers towards innovations. Thus, it is highly desirable that a realistic appraisal of farmers in this regard is made. This is possible only when a reliable and valid scale is developed for the

purpose. The following steps were followed in developing an attitude measurement scale:

3.3.1 <u>Item Collection</u>:

A number of items, that is statements, reflecting favourable and unfavourable attitude towards community fish farming, were developed by review of related literatures, functioning of F.F.D.A. and personal observation.

3.3.2 <u>Editing the sentences</u>:

Thurstone and Chane (1929), Wang (1932), Linkert (1932), Bird (1940) and Edward & Kilpatrick (1948) have suggested various informal criteria for editing statements to be used for construction of an attitude scale. Their suggestions are given below:

(a) Avoid statements that refer to the past rather than to the present;

(b) Avoid statements that are factual or capable of being interpreted as factual;

(c) Avoid statement that may be interpreted in more than one way;

(d) Avoid statements that are irrelevant to psychological object under consideration;

(e) Avoid statements that are likely to be endorsed by almost everyone or by almost no one;

(f) Select statements that are believed to cover the entire range of the effective scale of interests;

(g) Keep the language of the statements simple, clear and direct;

(h) Statements should be short, rarely exceeding 20 words;

(i) Statements containing universals such as always, none and never often induce ambiguity and should be avoided;

(j) Each statement should contain one complete thought;

(k) Words, such as only, just, nearly and others of a similar nature should be used with care and moderation in writing statements;

(l) Whenever possible, statements should be in the form of simple sentences rather in the form of compound or complex sentences;

(m) Avoid the use of words that may not be understood by those who are given completed scale; and

(n) Avoid the use of double negatives.

All the above mentioned measures were taken care of in the construction and development of sentences.

3.3.3 Development of a preliminary scale:

In the development of an attitude measurement scale, Linkert's method of summated rating was used. This method eliminates the need for judges to sort out the sentences and is, therefore, nor cumbersome. The importance of each sentence in this scale is fully emphasised.

3.3.4 Data collection:

Sixty-four small fish farmers and fifty-six large fish farmers were selected from forty-six villages of Chaka, Jasra and Meja blocks of Jamunapar region of Allahabad district. The were asked to react to each statement on the following five points:

SA	=	Strongly Agree
A	=	Agree
UD	=	Undecided
DA	=	Disagree
SDA	=	Strongly Disagree

5. <u>Item analysis</u>:

The item analysis is an important step to construct a valid and reliable scale. The purpose of item analysis is to examine how well each item discriminates between persons having different attitudes on the basis, the items with good discriminatory values were retained and other eliminated.

The following steps as suggested by Edwards were followed in the item analysis:

1. The total score was found for each person on all items in the preliminary series. The various responses were assigned numerical weights varying from five-strongly Agree, four-Agree, three-Undecided, two-Disagree, one-Strongly Disagree for positive sentences. This order was reversed in case of negative sentences. The total score was summation of numerical weights assigned to the responses which an individual checked;
2. The scored papers were place din the rank order of total scores;

3. Eighteen of the subjects with highest total scores and also eighteen of the subjects with the lowest total scores were segregated. it was assumed that these two groups would provide criterion groups in items of which to evaluate an individual statement;

4. In evaluating the responses in high and low groups on the individual statements, the following formula for critical ratio 't' was used:

$$t = \frac{\overline{XH} - \overline{XL}}{\sqrt{\dfrac{\sum(XH - \overline{XH})^2 + \sum(XL - \overline{XL})^2}{n(n-1)}}}$$

Where $\sum(XH - \overline{XH})^2 = \sum XH^2 - \dfrac{(\sum XH)^2}{n}$

and $\sum(XL - \overline{XL})^2 = \sum XL^2 - \dfrac{(\sum XL)^2}{n}$

$\overline{XH}$ = The mean score on a given statement for the high group

$\overline{XL}$ = The mean score on a given statement for the low group

n = Number of low group or high group

$\sum XH^2$ = Sum of the squares of the individual scores in the high groups

$\sum XL^2$ = Sum of the squares of the individual scores in the Low groups

5. The value of 't' is a measure of the extent to which a given statement differentiates between the high and low groups. As a crude and approximate rule of thumbs, we may regard any 't' value of equal to or greater than 1.75 as indicating that the average response of the high and low groups to a statement differs significantly, provided we have eighteen subjects in the high group and also in the low group. On this basis, the following sentences with 't' value of more than 1.75 were retained in the scale:

Table 3.4 Showing 't' value of retained attitude statements

Sl. No.	Statements	't' Value
1.	Fish farming can best be done only by the 'Mallah' community	2.89
2.	The present procedure of granting pattas (lease) to fish farmers is satisfactory and needs no improvement	3.95
3.	The supply of inputs like fingerlings and feeds etc. is timely and adequate	2.34
4.	C.F.F. System is not successful because village community pond is used for other purposes	2.60

Sl. No.	Statements	't' Value
5.	Taking loan for fish farming is a complicated process and hence everyone can not avail of it	3.50
6.	Community fish farming is only for rich and influential people of village	2.12
7.	Training of fish farmers through F.F.D.A. has helped farmers in better yield	2.39
8.	C.F.F. is a risky and complicated affair	3.25
9.	Marketing facilities for fish farmers are inadequate and need improvement	3.05
10.	C.F.F. is a profitable enterprise	4.44
11.	Fish farming is a must to supplement the improvement diet of the people	2.35
12.	Facilities provided by the F.F.D.A. are not enough	3.11
13.	Even people of high caste can successfully adopt C.F.F.	3.80
14.	The loans given for fish farming are not being regularly recovered	1.96

Table 3.5 **Showing 't' value of discarded attitude statements**

Sl. No.	Statements	't' Value
1.	The behaviour of extension personnel towards fish farming is not upto the mark	0.26
2.	The F.F.D.A. should have its own extension workers at the villages	0.36
3.	F.F.D.A. extension personnel do not possess the requisite expertise in fish farming	0.57
4.	It is possible to persuade vegetarian people to eat fish through mass education and persuasion	0.73

3.3.5 Test of reliability:

Reliability is the consistency with which a test yields the same result in measuring what is purported to measure. In this study, the split half method for testing reliability was used. The scores in each paper were split into two halves on the basis of odd and even number of statements and their scores added up. Thus, from every single paper, two sets of scores were obtained. A Pearson Product Moment correlation coefficient was calculated between the two sets of scores. The reliability of the test was found to be 0.33, which was very good considering that it

indicates near perfect correlation between the two variables. Thus, it was concluded that the scale was reliable for use.

3.3.6 Validity of the Scale:

The validity of the scale was calculated by comparing the scores of small and large fish farmers. The Mann Whitney U-Test was found to be 16.18, which yielded a significant result at 0.05 level of significance. Since the difference is this test was significant in the direction which one would logically expect. Therefore, the test was logically considered valid.

3.4 ECONOMIC DEVELOPMENT:

3.4.1 Classification of fishponds:

On the basis of stocking size and stocking density, fishponds (both small and large) were classified into four groups:

3.4.1.1 Small fishponds:

SPA Fry stage (25 - 30 mm) as a stocking material with stocking density 10,000 - 20,000 /ha /year;

SPB Fry stage (25 - 30 mm) as a stocking material with stocking density 20,001 and above/ha/year;

SPC Fingerling stage (80-120 mm) as a stocking material with stocking density 5,000-8,000/ha/year; and

SPD Fingerling stage (80-120 mm) as a stocking material with stocking density 8,001 and above/ha/year.

3.4.1.2 <u>Large fishponds</u>:

LPA Fry stage (25 - 30 mm) as a stocking material with stocking density 10,000 - 20,000/ha/year;

LPB Fry stage (25 - 30 mm) as a stocking material with stocking density 20,001 and above/ha/year;

LPC Fingerling stage (80-120 mm) as a stocking material with stocking density 5,000-8,000/ha/year; and

LPD Fingerling stage (80-120 mm) as a stocking material with stocking density 8,001 and above/ha/year.

3.4.2 <u>Cost analysis</u>:

Cost analysis of fish farms has been worked out for interpretation of the data. Mainly two types of costs are involved - Fixed Cost and Variable Cost.

Fixed Cost:

1. Rent of pond; and
2. Interest on fixed cost.

Variable Cost:

1. Cost of lime;
2. Cost of manure and fertiliser;
3. Cost of seed;
4. Cost of feed;
5. Cost of labour -(a) Hired labour (b) Family Labour;
6. Cost of Harvesting;
7. Miscellaneous Cost; and
8. Interest on Working Capital.

3.4.3 Input-output relationship:

Input-output relationship is an important analytical exercise for evaluating the variability of a particular enterprise. It is obtained by dividing the Gross Return (Output) of a farm divided by the Total Cost (Input). Thus,

$$\text{Input-output relationship} = \frac{\text{Gross Return}}{\text{Total Cost}}$$

3.5 DEVELOPMENT OF SCALES TO IDENTIFY THE PROBLEMS:

The study was measured by the scale developed by Haque (1981). The respondents listed out three most important problems they faced in the culture of fish and ranked them accordingly. The problems ranked 1, 2 and 3 were given scores 3, 2 and 1 respectively. The total rank score of each problem was obtained by multiplying the frequency with the respective score and adding them up. The problems were then arranged in descending order of importance on the basis of their total score and finally ranked. Three most important measures to these problems as perceived by the farmers also were ranked in a similar manner.

Table 3.6 Farming activities in different cluster of the study area

Sl. No.	Farming Activities	Selected Blocks / Clusters															
		CHAKA				JASRA						MEJA					
		Chaka I		Chaka II		Jasra I		Jasra II		Jasra III		Meja I		Meja II		Meja III	
		S	L	S	L	S	L	S	L	S	L	S	L	S	L	S	L
1.	Fish Farming	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2.	Fish + Duck Farming	X	X	✓	X	✓	X	X	✓	✓	✓	✓	X	X	X	X	✓
3.	Fish + Pig Farming	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.	Fish + Livestock	✓	X	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	X	✓	✓	✓
5.	Fish + Poultry	✓	X	X	X	X	X	✓	✓	X	✓	✓	✓	X	X	✓	X
6.	Fish farming + Agriculture	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	X	X	✓	✓

S = Small L = Large

NOTE : ✓ indicates farming activities included in the study

X indicates farming activities not included in the study

CHAPTER IV

RESULT AND DISCUSSION

The present study is mainly based on primary data that have been collected and obtained through the structured schedule. The results obtained from the analysis of data presented and discussed in this Chapter under five main heads based on objectives of the study, viz.

4.1 Present status of community fish farming practices in Jamunapar region of Allahabad district. Sub heads are:

4.1.1 Physical status of community pond in C.F.F. system;

4.1.2 Cultural practices/managemental aspect of C.F.F. system; and

4.1.3 Personal profile and Socio-economic status of fish farmers of C.F.F. system.

4.2 Attitude of fish farmers towards community fish farming system.

4.3 Development of fallow, unproductive and marginally productive lands and employment generation.

4.4 Economics of community fish farming.

4.5 Problems in C.F.F. system with suggestive measures.

In this chapter these five heads have been analysed and discussed.

4.1 PRESENT STATUS OF COMMUNITY FISH FARMING PRACTICES IN JAMUNAPAR REGION OF ALLAHABAD DISTRICT:

During the course of data collection, an effort was made to find out present status of community fish farming practice. The analysis made in this regard is presented in this section. This section is divided into three sub sections:

A) Physical status of community pond in C.F.F. system of study area; and

B) Cultural practices/managemental aspects of community fish farming system - Comparison of cultural practices of small and large fish farmers in C.F.F. system; and

C) Personal profile Socio-economic status of fish farmers of C.F.F. system - Comparison of personal profile and socio-economic status of small and large fish farmers. It is in fulfilment of the first objective set up for the study.

4.1.1 Physical status of community fish pond in C.F.F. system:

Table 4.1 presents details about community fishpond of the study area. Total number of small ponds and large ponds surveyed was 64 and 56 respectively. On the basis of depth community fish-pond classified as shallow pond (>1 m deep) medium depth pond (1.5-2.5 m) and deep pond (>2.5 m). Among small ponds 19(29.69%) were shallow, 27(42.19%) were medium and 18(14.29%) were deep pond. Among large community ponds 8(14.29%) were shallow, 15(26.79%) were medium depth pond and 33(58.92%) were deep pond. From the table it is clear that 51(42.5%) community ponds were deep and 42(35.00%) community ponds were medium deep pond and 27(22.5%) community ponds were shallow and not good for fish farming.

The maximum depth of small pond ranges from 85.00 cm to 275.00 cm and average depth 147.70 cm. The maximum depth of large pond ranges from 90.00 cm to 295.00 cm and average depth 182.70 cm.

Table 4.1 Details about community fish pond of C.F.F. system in study area

Sl. No.	Particulars about pond.	Small Pond (> 1 ha)		Large Pond (< 1 ha)		Total	
		No.	%	No.	%	No.	%
1.	Number of ponds surveyed	64	100.00	56	100.00	120	100.00
2.	Total area under community pond surveyed (ha)	43.41	-	97.95	-	141.36	-
3.	Pond average size (ha)	0.68	-	1.75	-	1.18	-
4.	Range of pond size (ha)	0.12-0.95	-	1 - 4.25	-	0.12-4.25	-
5.	Depth of pond						
i.	Shallow pond (>1 m depth)	19	29.69	8	14.29	27	22.50
ii.	Medium pond (1.5 - 2.5 m)	27	42.19	15	26.79	42	35.00
iii	Deep pond (<2.5m)	18	28.12	33	58.92	51	42.50
6.	Range of maximum pond depth (m)	0.85-2.75	-	0.90-2.95	-	0.85-2.95	-
7.	Pond average depth (m)	147.7	-	182.7	-	-	-
8.	Classification of fish pond on the basis of irrigation						
(a)	Rain fed pond	14	21.875	18	32.14	32	26.67
(b)	Ground water fed pond.	24	37.5	21	37.5	45	37.5
(c)	Canal fed pond	26	40.625	17	30.36	43	35.83
9.	Classification of fishpond on the basis of water retention.						
(a)	Seasonal pond	46	71.875	23	41.07	69	57.5
(b)	Perennial pond	18	28.125	33	58.92	51	42.5

The total area under small community ponds under study area was 43.41 ha and average size of small pond was 0.68 ha. The total area under large community ponds surveyed was 97.95 ha and average size of large fishponds was 1.75 ha. Total surveyed pond area was 141.36 ha.

The range of ponds' size in case of small pond varied from 0.12 to 0.95 ha and the range of large ponds size surveyed were 1 to 4.25 ha.

In case of small ponds 14(21.875%) were rainfed pond, 24(37.5%) small ponds were ground water fed pond and 26(40.625%) small ponds were canal fed ponds. In case of large community ponds 21(37.5%) were ground water fed ponds, 18(32.14%) were rainfed ponds and 17(30.36%) were canal fed pond.

On the basis of water retention the community ponds were classified as seasonal and perennial pond. Most of the small ponds 46(71.875%) were seasonal and 18(28.125%) were perennial ponds, whereas 33(58.92%) large ponds were perennial and 23(41.07%) were seasonal ponds.

From physical status discussed in this section, it shows that community ponds were good for scientific fish culture.

4.1.2 Cultural practices of respondent:

The major cultural/managemental practices chosen for description and comparison were:

(a) Seed management practices in C.F.F. system

i. Fish seed collection;

ii. Stocking combination of fish seed; and

iii. Stocking density of fish seed.

(b) Feed and feeding management practices in C.F.F. system:

i. Types of feed used in C.F.F. system;

ii. Feeding management; and

iii. Level of fish feed application.

(c) Manuring in C.F.F. system:

i. Types of manure used in C.F.F. system;

ii. Level of manure application with their recommended rate.

(d) Liming to pond in C.F.F. system

i. Use of lime in C.F.F. System; and

ii. Level of manure application with their recommended doses.

(e) Harvesting:

i. Nets used during the time of harvesting; and

ii. Number of harvesting in single crop.

4.1.2.1 Seed management practices in C.F.F. system:

4.1.2.1.1 Fish seed collection:

Table 4.2 Distribution of the fish farmers according to fish seed collection

SF = 64 LF = 56

Sl. No.	Fish seed collection	Small fish farmer		Large fish farmer		Total	
		No.	Percent-age	No.	Percent-age	No.	Percentage
1.	From fish seed hatchery	28	43.75	20	35.71	48	40
2.	Riverine collection	16	25.00	12	21.43	28	23.33
3.	Supplied from Howrah (W.B)	20	31.25	24	42.86	44	36.67
	Total	**64**	**100**	**56**	**100**	**120**	**100**

x^2 = 1.74, DF = 2, non significant at 0.05% level of significance.

The table 4.2 shows the distribution of fish farmers according to collection of fish seed. Figures reveal that 28(43.75%) small fish farmers collected fish seed from nearby hatchery, whereas 20 (35.71%) large fish farmers collect fish seed from hatchery. 16(25.00%) of small fish farmers and 12 (21.43%) large fish farmers collect seed from river (Jamuna). 20(31.25%) of small fish farmers and 24 (42.86%) of large fish farmers buy seed from Hawker, who collect seed from Howrah (W.B). From the above

table, it is clear that majority of small farmers collects seed from local hatchery and majority of large fish farmers collects seed, which supplied from Howrah, West Bengal.

To find out if there was a significant difference between small and large fish farmers regarding their seed collection, the Null hypothesis was tested:

Null hypothesis (Ho)

There was no significant difference between small and large fish farmers as regards their seed collection practices.

The calculated value of x^2 was found to be 1.74, which was less than the table value of 5.99 at 0.05 per cent level of significance for two degree of freedom. Therefore, the null hypothesis (Ho) was accepted.

Therefore, it may be concluded that there was no significant difference between small and large fish farmers regarding their seed collection practice. Both collects fish seed from where seed is easily available and good in quality.

4.1.2.1.2.1 Stocking combination of fish seed:

Table 4.3 Distribution of the fish farmers according to stocking combination of fish seed in C.F.F. System

Sl. No.	Stocking Combination	Small fish farmer		Large fish farmer		Total	
		No.	%	No.	%	No.	%
1.	Indian major Carps (I.M.C.)* (3-spp combination)	46	71.875	30	53.57	76	63.33
2.	I.M.C. + Common Carp (4 spp. Combination)	18	28.125	22	39.29	40	33.33
3.	I.M.C. + Exotic Carps ** (6 spp combination)	-	-	4	7.14	4	3.33

x^2 = 7.27, DF = 2, significant at 0.05% level of significance.

* Indian major carps = Catla, Rohu & Mrigal

** Exotic Carp = Silver Carp, Grass carp, common carp

From the above table it is found that Indian major carps are most popular stocking combination in community fish farmers practices. Among exotic carps, only common carp is popular among both small and large fish farmers. The table reveals that 46 (71.875%) of small fish farmers and 30(53.57%) of large fish farmers preferred the Indian major carp as stocking combination, i.e. 3-spp combination. 18 (28.125%) small fish farmers and 22(39.29%) large fish farmers prefer the 4-spp combination. Three

Indian major carp and common carp fish spp. Only 4 (7.14%) large farmers culture 6-spp combination.

To find out if there was a significant difference between small and large fish farmers regarding their stocking combination of fish seed, the following Null hypothesis was tested:

Null hypothesis (Ho):

There was no significance difference between small and large fish farmers as regards the stocking combination of fish seed.

The calculated value of x^2 was found to be 7.27 which was greater than the table value of 5.99 at 0.05 percent level of significance for two degree of freedom. Therefore, the null hypothesis (Ho) was rejected and alternative hypothesis was accepted.

Therefore, it may be concluded that there was significant difference between small and large fish farmers regarding their stocking combination. Large farmers keenly prefer exotic carps along with Indian major carp, as a stocking material.

4.1.2.1.3 Stocking Density and stocking size of Fish Seed:

Table 4.4 shows the distribution of fish farmers according to stocking density of fish seed

Table 4.4 Distribution of fish farmers according to stocking density of fish seed

Sl. No.	Fish seed size and Stocking Density / ha	Small fish farmer		Large fish farmer		Total	
		Freq.	%	Freq.	%	Freq.	%
1.	Fry stage (10,000-20,000)	16	25.00	14	25.00	30	25.00
2.	Fry Stage (20,001 and above)	16	25.00	14	25.00	30	25.00
3.	Fingerling stage (5,000 - 8,000)	16	25.00	14	25.00	30	25.00
4.	Fingerling stage (8,001 and above)	16	25.00	14	25.00	30	25.00
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**

Fry stage : 25 - 30 mm in length

Fingerling : 80 - 120 mm in length

Table 4.4 points out that 16(25.00%) of small fish farmers and 14(25.00%) of large fish farmers stock fry stage fish seed with stocking density of 10,000-20,000/ha and 16(25.00%) of small fish farmers and 14(25.00%) of large fish farmers stocks more than 20,000/ha fry in their pond. 16(25.00%) of small fish farmers and 14(25.00%) of large fish farmers stocks fingerling stage with stocking density of 5,000-8,000 /ha and 25 percent of both small fish farmers and large fish farmers stock fingerling stage of seed more than 8,000/ha.

4.1.2.2 Feed and Feeding management practices in C.F.F. system:

4.1.2.2.1 Types of feed used in C.F.F. system of study area:

Table 4.5 indicates the various types of feed used in C.F.F. system of study area.

Table 4.5 Distribution of fish farmers according to types of feed used in C.F.F. system

Sl. No.	Type of feed	Small fish farmer		Large fish farmer		Total	
		Freq.	%	Freq.	%	Freq.	%
1.	Plankton (natural food of fish)	8	12.5	0	0.00	8	6.67
2.	Rice bran / Rice polish	31	48.44	21	37.5	52	43.33
3.	Rice bran + mustard oil cake	25	39.06	35	62.5	60	50.00
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**
x^{2} = 8.11, DF = 2, significant at 0.05% level of significance							

Table 4.5 shows those only 8(12.5%) small fish farmers depended on natural fish food plankton, which grows in pond water. They did not provide any supplementary food. 31(48.44%) small fish farmers used rice bran/rice polish as supplementary food to fish and 25(39.06%) small fish farmers use balanced supplementary feed rice bran and mustard oil cake to their pond as fish feed. On the other hand, table

indicates that all large fish farmers provide supplementary feed beside the plankton, which is natural food. 35(62.5%) large fish farmers provide balanced supplementary feed, i.e. rice bran and mustard oil cake, which is locally available fish feed. 21 (37.5%) large fish farmers provide only rice bran/ rice polish as fish feed.

To find out if there was a significant difference between small and large fish farmers regarding type of fish feed they use, the null hypothesis was tested.

Null hypothesis (Ho):

There was no significant difference between small and large fish farmers as regards fish feed they use.

The calculated value of x^2 was found to be 8.11 which was greater than the table value of 5.99 at 0.05% level of significance for two degree of freedom. Therefore, the null hypothesis (Ho) was rejected and another hypothesis was accepted.

Therefore, it may be concluded that there was significant difference between small and large fish farmers regarding type of fish feed they use. Large

fish farmers were more scientifically advance and particular in providing balanced diet to fish.

4.1.2.2.2 Feeding method used by fish farmers in C.F.F. system.

Table 4.6 Distribution of fish farmers according to feeding method of fish

Sl. No.	Feeding method	Small fish farmer		Large fish farmer		Total	
		Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**
1.	Broad casting feeding method	23	41.07	19	33.93	42	37.5
2.	Basket feeding method.	4	7.14	6	10.71	10	8.93
3.	Bag feeding method	29	51.79	31	55.36	60	53.57
	Total	**56**	**100.00**	**56**	**100.00**	**112**	**100.00**
x^{2} = 0.85, DF = 2, Non-significant at 0.05% level of significance							

Table 4.6 presents that out of 64 small fish farmers only 56 fish farmers provide supplementary feed to fish. 8 small fish farmers depended on only natural fish food i.e. plankton (Table 4.5).

Table 4.6 indicates that out of 56 small fish farmers 23(41.07%) small fish farmers use broad casting feeding method, 4(7.14%) small fish farmers use basket feeding method 1 and 29(51.79%) small fish farmers prefer bag feeding method.

Table 4.6 gives idea that 31(55.36%) of large fish farmers prefer bag feeding method followed by broadcasting method 19(33.93%) and basket feeding method 6(10.71%).

From above table it is clear that bag-feeding method is most popular among both small and large fish farmers 60(53.57%) because it is time saving process.

To find out if there was a significant difference between small and large fish farmers regarding their feeding method the null hypothesis was tested.

Null hypothesis (Ho):

There was no significant difference between small and large fish farmers as regards their feeding method.

The calculated value of x^2 was found to be 0.85, which was lesser than the table value of 5.99 at 0.05 percent level of significance for two degree of freedom. Therefore, the null hypothesis was accepted and alternative hypothesis was rejected.

Therefore, it may be concluded that there was no significant difference between small and large fish farmers regarding their feeding management.

4.2.2.3 Level of feed applications with their recommendation rate in C.F.F. system:

Table 4.7 shows the level of feed applications with their recommended rate in C.F.F. system.

Table 4.7 The level of feed application with recommended rate in C.F.F. system

Sl. No.	Supplementary Feed (kg/ha/yr)	Small fish farmers	Large fish farmers
1.	Actual rate (Average)	1325.34	1606.85
2.	Recommended rate	2500.00	2500.00
3.	Percentage of recommended rate	53.01	64.27

Table 4.7 clearly indicates that large fish farmers (1606.85 kg/ha) use more feed than the small fish farmers (1325.34 kg/ha). Small fish farmers use feed 53.01% of recommended rate where as large fish farmers use feed 64.27% of recommended rate.

4.2.3 Manuring in community fish farming system:

4.2.3.1 Types of manure used in C.F.F. system:

Table 4.8 shows types of manure used in C.F.F. system.

Table 4.8 Distribution of fish farmers according to types of manure used in C.F.F. system

Sl. No.	Types of Manure	Small fish farmer		Large fish farmer		Total	
		Freq.	%	Freq.	%	Freq.	%
1.	Cattle dung	45	70.31	42	75.00	87	72.5
2.	Poultry litter	5	7.81	6	10.71	11	9.17
3.	Duck droppings	14	21.88	8	14.29	22	18.33
4.	Pig manure	-	-	-	-	-	-
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**

x = 1.3, DF = 2, Non-significant at 0.05% level of significance

Table 4.8 gives idea about different types of manure used in C.F.F. system. The table indicates that 40 (70.31%) small and 42 (75.00%) large fish farmers manure their pond with cattle dung, which is easily available in village. 14(21.88%) small and 8 (14.29%) large fish farmers manure their pond with duck droppings and only 5(7.81%) small fish farmers and 6(10.71%) large fish farmers manure their pond with poultry litter. Pig manure is totally absent in study area because community pond is used in other purpose also.

From the above table, it is clear that 87(72.5%) fish farmers prefer cattle dung as pond manure as it is easily available.

To find out if there was a significant difference between small and large fish farmers regarding their type of manure the null hypothesis was tested.

Null hypothesis (Ho):

There was no significant difference between small and large fish farmers as regards type of manure they used.

The calculated value of x^2 was found to be 1.3, which was lesser than the table value of 5.99 at 0.05% level of significant for two degree of freedom. Therefore, the null hypothesis (Ho) was accepted and alternative hypothesis was rejected.

Therefore, it may be concluded that there was no significance difference between small and large fish farmers as regards types of manure they used.

4.1.2.3.2 Level of manure application with their recommended rate in C.F.F. system:

Table 4.9 shows the level of manure application with their recommended rate in C.F.F. system.

Table 4.9 The level of manure application with recommended rate in C.F.F. system

Sl. No.	Types of manure	Small fish farmers			Large fish farmers		
		Recommended rate (t/ha)	Actual rate (t/ha)	% of recommended rate	Recommended rate (t/ha)	Actual rate (t/ha)	% recommended rate
1.	Cattle dung (t/ha)	20	6.320	31.60	20	5.360	26.80
2.	Poultry litter(t/ha)	18	2.025	11.25	18	2.500	13.89
3.	Duck droppings (t/ha)	15	3.250	21.67	15	3.420	22.80

Table 4.9 points out that small fish farmers use cattle dung 31.6% of recommended rate and large fish farmers use cattle dung 26.8% of recommended rate. In case of poultry litter small fish farmers use only 11.25% of recommended rate and large fish farmers use 13.89% of recommended rate. In case of such dropping small fish farmers use 21.67% and large fish farmers 22.8% of recommended rate.

Therefore, it may be concluded that community fish farmers use low amount of manure than recommended dose, because village ponds are rich in organic manure and in rainy season the load of organic matter increase.

4.1.2.3 Liming to pond in C.F.F. system:

4.1.2.4.1 Use of Lime in C.F.F. system:

Table 4.10 presents the distribution of fish farmers according to use of lime.

Table 4.10 Distribution of fish farmers according to use of lime

Sl. No.	Use of Lime	Small fish farmer		Large fish farmer		Total	
		Freq.	%	Freq.	%	Freq.	%
1.	Occasional	31	48.43	40	71.43	71	59.17
2.	Only at the time of pond preparation	19	29.69	10	17.86	29	24.17
3.	Regular interval	14	21.88	6	10.71	20	16.67
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**
X^2 = 6.63, DF = 2, significant at 0.05% level of significance							

The table indicates that fish farmers occasionally use lime 71(59.17%) of which 31(48.43%) are small fish farmers and 40(71.43%) are large fish farmers. 19(29.69%) small and 10(17.86%) large fish farmers use lime only at the time of pond preparation and small number of 6(10.71%) large fish farmers and 14 (21.88%) small fish farmers use lime at regular interval.

The table clarifies that a majority of fish farmers use lime when they need it, especially when diseases or stress in pond environment takes place.

To find out if there was a significant difference between small and large fish farmers regarding their use of lime, the null hypothesis was tested.

<u>**Null hypotheses (Ho)**</u>:

There was no significant difference between small and large fish farmers as regards use of lime.

The calculated value of x^2 was found to be 6.63 which was greater than the table value of 5.99 at 0.05% level of significance for two degree of freedom. Therefore, the null hypothesis was rejected and alternative hypothesis was accepted.

Therefore, it may be concluded that there was significant difference between small and large fish farmers regarding their use of lime. Small fish farmers are more particular in using lime at regular interval.

4.1.2.4.2 Level of lime application with their recommended doses:

Table 4.11 Level of lime application with their recommended doses

Sl. No.	Lime doses kg/ha/yr.	Small fish farmers	Large fish farmers
1.	Actual rate (Average)	252.03	309.40
2.	Recommended doses *	2000.00	2000.00
3.	Percentage of recommended doses	12.60	15.47

* @ 200 kg / ha in case of neutral pH per month.

The views regarding level of lime application with their recommended doses presented in table 4.11 shows clearly that large fish farmers use average 309.4 kg/ha of lime in a year, where recommended doses @ 200 kg/ha/month for ten month will be 2000 kg /ha and percentage of recommended doses 15.47% in case of large fish farmers and 12.6% in case of small fish farmers. The average dose of lime is 252.03 kg/ha/yr. in case of small fish farmers.

4.1.2.5 **Harvesting:**

4.1.2.5.1 Nets used during the time of harvesting in C.F.F. system:

Table 4.12 Distribution of fish farmers according to type of nets used in C.F.F. system

Sl. No.	Types of Net	Small fish farmer		Large fish farmer		Total	
		Freq.	%	Freq.	%	Freq.	%
1.	Gill net	20	31.25	14	25.00	34	28.33
2.	Drag Net	44	68.75	37	66.07	81	67.50
3.	Cast Net	-	-	5	8.93	5	4.17
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**

x^2 = 6.16, DF = 2, significant at 0.05% level of significance

An attempt was made to find out the distribution of fish farmers according to types of net and findings are reflected in table 4.12.

Before turning to the issue of the table, it would be proper to state about different nets. In the study area different nets and traps are used for fishing from ponds. In the table depicts only the nets, which are used for commercial catch from ponds. The traps and hooks and lines are used for only catching few fish for household use.

Table shows that dragnets are commonly used by both small 44 (68.75%) and large 37 (66.07%) fish

farmers. 20 (31.25%) small and 14 (25.00%) large fish farmers used Gill nets. Cast net was used only by a small amount of large fish farmers 5 (8.93%).

From the above table, it can be seen that dragnets are most popular gears for harvesting fish.

To find out if there was a significant difference between small and large fish farmers regarding nets used in harvesting, the null hypothesis was tested.

Null hypothesis (Ho):

There was no significant difference between small and large fish farmers as regards nets used during harvesting.

The calculated value of x^2 was found to be 6.16 at 0.05% level of significance for two degree of freedom. Therefore, the null hypothesis was not accepted and alternative hypothesis was not rejected.

Therefore, it may be concluded that there was significant difference between small and large fish farmers regarding net. Large fish farmers used different types of net, viz. gill net, drag net and cast net.

4.1.2.5.2 Number of netting takes place during cultivation period in C.F.F. system:

Table 4.13 **Distribution of fish farmers according to number of netting takes place during cultivation period in C.F.F. system**

Sl. No.	No. of netting in a year.	Small fish farmer		Large fish farmer		Total	
		Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**
1.	1 to 2 times	28	43.75	18	32.14	46	38.33
2.	3 to 4 times	24	37.5	14	25.00	38	31.67
3.	More than 4 times	12	18.75	24	42.86	36	30.00
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**

x^2 = 8.31, DF = 2, significant at 0.05% level of significance

Table 4.13 charts out number of nettings takes place by farmers for complete harvesting. Majority of small fish farmers 28(43.75%) harvested their produce 1 to 2 times, 24(37.5%) small fish farmers harvested their produce 3 to 4 times in a year and 12(18.75%) harvest more than 4 times for complete harvesting. On the other hand, 24(42.86%) large fish farmers harvest fish more than 4 times and 18(32.14%) large fish farmers harvest fish 1 to 2 times and 14(25.00%) large fish farmers harvest fish 3 to 4 times in a year.

From the above table, it is clear that small fish farmers harvest their produce 1 to 2 times because mostly they borrow nets on rent, and large fish farmers have their own net.

To find out if there was a significant difference between small and large fish farmers regarding number of netting, the null hypothesis was tested.

<u>Null hypotheses</u>:

There was no significant difference between small and large fish farmers as regards number of netting.

The calculated value of x^2 was found to be 8.31 which was greater than the table value of 5.99 at 0.05% level of significance for two degree of freedom. Therefore, the null hypotheses were not accepted and alternative hypotheses were not rejected.

Therefore, it may be concluded that there was significant difference between small and large fish farmers regarding number of netting.

4.1.3 Comparison of personal profile and socio-economic status of small and large fish farmers:

This section is devoted to the description and comparison of selected personal characteristics and socio-economic status of fish farmers of C.F.F. system.

4.1.3 Personal profile of Respondents:

The personal characteristics chosen for description and comparison were:

(a) Age

(b) Caste

(c) Education

(d) Experience

(e) Occupation

(f) Size of land holding

(g) Size of family

(h) Socio-economic status of small and large fish farmers of C.F.F. system.

4.1.3.1 Age of fish farmer:

Table 4.14 Distribution of the fish farmers according to age group

SF - 64, LF - 56

Sl. No.	Age Group	Small fish farmers		Large fish farmers	
		Number	Percentage	Number	Percentage
1.	Young (20-35 yrs.)	22	34.375	18	32.14
2.	Middle (35-50 yrs.)	34	53.125	32	57.14
3.	Old (50-65 yrs.)	8	12.500	6	10.72
	Total	**64**	**100.000**	**56**	**100.00**

Table 4.14 shows distribution of the fish farmers according to their age group. The table shows that 8(12.5%) small fish farmers were under old age group, whereas 6(10.72%) large fish farmers in the same group. Therefore, 34(53.125%) small fish farmers under middle aged group people and 32(57.14%) large fish farmers under the middle-aged group. 22(34.375%) and 18 (32.14%) of small fish farmers and large fish farmers respectively were in young aged group.

From the above table, it is found that small and large fish farmers were middle-aged people. It may be due to nature of fish farming as business. It requires lot of efforts and resources to establish the business. Therefore, comparatively older age and experience are required for fish farming business.

In order to find out if there was significant difference between small and large fish farmers regarding their age, the following null hypothesis (Ho) was tested.

Null hypothesis (Ho)

There was no significant difference between small and large fish farmers as regards their age. The age of small and large fish farmers arranged chronologically are contained in the Table 4.15.

Table 4.15 Showing age scores of fish farmers

N (SF) - 64 , N (LF) - 56

Sl. No.	Age SF	Age LF	Sl. No.	Age SF	Age LF	Sl. No.	Age SF	Age LF	Sl. No.	Age SF	Age LF
1	21	34	17	49	31	33	44	28	49	47	40
2	29	31	18	22	46	34	27	32	50	45	37
3	40	32	19	26	45	35	54	51	51	36	51
4	22	29	20	43	43	36	32	45	52	54	43
5	28	49	21	42	33	37	53	27	53	37	54
6	42	27	22	45	42	38	43	28	54	34	48
7	21	48	23	43	45	39	30	42	55	36	49
8	44	32	24	21	41	40	42	41	56	33	52
9	45	41	25	42	42	41	41	30	57	39	-
10	26	43	26	37	45	42	31	39	58	42	-
11	45	53	27	55	41	43	40	36	59	43	-
12	52	44	28	31	29	44	39	31	60	23	-
13	46	48	29	38	33	45	27	37	61	44	-
14	47	32	30	59	42	46	38	31	62	52	-
15	25	43	31	30	53	47	47	38	63	27	-
16	48	48	32	43	43	48	28	37	64	52	-
Z = 0.21, Non significant at 5% level of Significance.											

The calculated value was found to be 0.21, which was less than the table value of Z(1.96) at 5% level

of significance. Hence, null hypotheses were accepted. It may be concluded that there was no significant difference between small and large fish farmers regarding their age. Both small and large fish farmers were middle-aged people.

4.1.3.2 Caste of fish farmers:

Out of 120 fish farmers 108(90%) were Hindu in religion and 12(10%) were Muslims in faith.

The following table shows the caste wise distribution of small and large fish farmers:

Table 4.16 Showing caste of fish farmers:

N (SF) = 60, N (LF) = 48

Sl. No.	Caste	Small fish farmers		Large fish farmers		Total	
		No.	%	No.	%	No.	%
1.	Thakur	3	5.00	2	4.67	5	4.63
2.	Yadav	1	1.67	-	-	1	0.09
3.	Patel	5	8.33	4	8.33	9	8.33
4.	Mallah	37	61.67	33	68.75	70	64.81
5.	Harijan	14	23.33	9	18.75	23	21.29
	Total	**60**	**100.00**	**48**	**100.00**	**108**	**100.00**

Table 4.16 shows distribution of fish farmers in relation to their caste category. Among 108 fish farmers, only 5(4.63%) belongs to Thakur caste, only

1(0.09%) belongs to Yadav and 9(8.33%) belongs to Patel and 70(64.81%) belongs to Mallah caste. Total backward class was dominated by Mallah. 23(21.29%) of fish farmers belongs to Harijan caste. In case of small fish farmers 37(61.67%) and large fish farmers 33(68.75%) belong to Mallah caste. The most significant thing was that Mallah constituted the majority among small and large fish farmers. This is an occupation, which traditionally belongs to "Mallah". Higher caste contributes smaller number in table. It is quite logical that this was so because among higher caste fish farming is considered as a taboo. But small number of higher caste involved in fish farming shows the breaking of the barrier of caste. This is welcome.

To find out if there was a significant difference between small and large fish farmers regarding their caste, the following null hypothesis (Ho) was tested.

Null Hypothesis (Ho)

There was no significant difference between small and large fish farmers as regards their caste.

The frequency distribution of small and large fish farmers regarding their caste is given in the following table:

Table 4.17 Showing comparison of caste of fish farmers

N (SF) = 60, N (LF) = 48

Sl. No.	Caste category	Small fish farmers	Large fish farmers	Total
1.	High Caste	3	2	5
2.	Backward caste	43	37	80
3.	Scheduled Caste	14	9	23
	Total	**60**	**48**	**108**

X = 0.41, DF = 2 Non-significant at 0.05% level of significance.

The calculated value of x^2 was found to be 0.41, which was less than the table value of 5.99 at 0.05% level of significance for two degree of freedom. Therefore, null hypotheses were accepted.

Therefore, it may be concluded that there was no significant difference between small and large fish farmers regarding their caste. Mostly all of them belong to 'Mallah' caste.

4.1.3.3 Education level of fish farmers:

Education of fish farmers was categorised into different levels as per the number of classes passed

and ability to read and write. The following table shows the distribution of small and large fish farmers in connection with their educational level.

Table 4.18 Distribution of the fish farmers according to education level

Sl. No.	Education Level	Small fish farmers		Large fish farmers		Total	
		No.	%	No.	%	No.	%
1.	Illiterate	18	28.13	7	12.5	25	20.83
2.	Can read & Write	7	10.94	5	8.93	12	10.00
3.	Upto Primary School	8	12.5	4	7.14	12	10.00
4.	Upto Junior High School.	14	21.88	19	33.93	33	27.5
5.	Upto High School	9	14.06	11	19.64	20	16.67
6.	Upto Inter-mediate	8	12.5	8	14.29	16	13.33
7.	Graduation & above	0	0.00	2	3.57	2	1.67
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**

As figures in the above table showed that the 18 (28.13%) small fish farmers were illiterate and a few number of small fish farmers 7(10.94%) could read and write, whereas 7(12.5%) large fish farmers were illiterate and 5(8.93%) of large fish farmers could read and write.

Table 4.18 points out that the maximum number of small fish farmers 14(21.88%) had education level

equal to Junior High School, followed by High School level 9(14.06%), Primary school and upto Intermediate level 8(12.5%) each.

The table indicates that the maximum number of large fish farmers 19(33.93%) had education level equal to Junior High School, followed by High School level 11(19.64%), Intermediate level 8(14.29%), Primary level 4(7.14%) and only 2(3.57%) large fish farmers had graduation level of education.

To find out if there was a significant difference between small and large fish farmers regarding their education, the following null hypothesis (Ho) was tested.

Null Hypothesis (Ho):

There was no significant difference between small and large fish farmers as regards their education.

The frequency distribution of small and large fish farmers regarding their education is given in the following table:

Table 4.19 Showing comparison of educational level of fish farmers

Sl. No.	Educational categories	Small fish farmers	Large fish farmers	Total
1.	Higher	08	10	18
2.	Middle	23	30	53
3.	Lower	33	16	49
	Total	**64**	**56**	**120**
X^2 = 6.54 D.F. = 2, significant at 0.05% level of significance,				

The calculated value of x^2 was found to be 6.54, which was greater than the Table value of 5.99 at 0.05 percent level of significance for two degree of freedom. Therefore, the null hypothesis (Ho) was rejected and alternative hypothesis was accepted.

Therefore, it may be concluded that there was significant difference between small and large fish farmers regarding their education. Large fish farmers had more education than Small fish farmers.

4.1.3.4 Experience of fish farmers in community fish farming:

Table 4.20 Distribution of fish farmers according to their experience

Sl. No.	Experience (Years)	Small fish farmers		Large fish farmers		Total	
		No.	%	No.	%	No.	%
1.	> 5 years	16	25	8	14.29	24	20.00
2.	5-10 years	38	59.375	35	62.50	73	60.83
3.	Above 10 years	10	15.625	13	23.21	23	19.17
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**

Table 4.20 indicates the distribution of the fish farmers according to their experience. Majority of small fish farmers 38(59.375%) and 35(62.50%) large fish farmers had 5-10 years experience in community fish farming. About 16(25.00%) and 8 (14.29%) of Small fish farmers and large fish farmers respectively had below 5 years experience. Small and Large fish farmers there were 10 (15.625%) and 13 (23.21%) respectively had experience above 10 years.

To find out if there was a significant difference between small and large fish farmers regarding their experience, the following null hypothesis (Ho) was tested.

Null Hypothesis (Ho):

There was no significant difference between small and large fish farmers as regards their experience.

The frequency distribution of small and large fish farmers regarding their experience is given in the following table:

Table 4.21 Showing comparison of experience level of fish farmers

N (SF) = 64, N (LF) = 56

Sl. No.	Experience level	Small fish farmers	Large fish farmers	Total
1.	Higher (Above 10 years)	10	13	23
2.	Middle (5-10 years)	38	35	73
3.	Lower (<5 years)	16	8	24
	Total	**64**	**56**	**120**
x^2 = 2.66 D.F. = 2, significant at 0.05% level of significance,				

The calculated value of x^2 was found to be 2.66, which was less than the table value of 5.99 at 0.05 percent level of significant for two degree of freedom. Therefore, null hypothesis was accepted.

Therefore, it may be concluded that there was no significant difference between small and large fish

farmers regarding their experience. Both had medium level of experience in community fish farming.

4.1.3.5 Occupation of fish farmers:

The following table shows the occupation of fish farmers:

Table 4.22 Showing fish farming as main occupation or supplementary occupation of fish farmers

N (SF) = 64, N (LF) = 56

Sl. No.	Occupation.	Small fish farmers		Large fish farmers		Total	
		No.	%	No.	%	No.	%
1.	Fish farming as main occupation.	20	31.25	18	32.14	38	31.67
2.	Fish farming as supplementary occupation.	44	68.75	38	67.76	82	68.33
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**

Table 4.22 indicates that 82(68.33%) as supplementary occupation and in case of 20(31.25%) small fish farmers and 18(32.14%) large fish farmers; fish farming was main occupation.

Table 4.23 Distribution of main occupation of fish farmers where fish farming was supplementary occupation

N (SF) = 44, N (LF) = 38

Sl. No.	Main Occupation	Small fish farmers		Large fish farmers	
		No.	Percentage	No.	Percentage
1.	Agriculture	22	50.00 (34.375)*	24	63.16 (42.86)*
2.	Business	3	6.82 (4.691)*	4	10.53 (7.14)*
3.	Caste occupation	4	11.00 (6.250)*	2	5.26 (3.57)*
4.	Service	2	4.55 (3.125)*	-	-
5.	Fish from river.	13	29.55 (20.31)*	8	21.05 (14.29)*
	Total	**44**	**100.00 (68.750)***	**38**	**100.00 (67.76)***

* Percentage of total fish farmers.

It was evident from the above table that most of the small fish farmers 22(34.37%) had agriculture as main occupation, whereas large fish farmers 24 (42.86%) the agriculture was also main occupation. The second main occupation of fish farmers were fishing from river, 13(20.31%) and 8(14.29%) small and large fish farmers respectively. Other main occupation of small fish farmers were business 3 (4.69%), caste occupation 4(6.25%) and service 2 (3.125%). Other main occupation of large fish farmers were business 4(7.14%) and caste occupation 2(3.57%).

Table 4.24 Distribution of supplementary occupation where fish farming was main occupation

N (SF) = 20, N (LF) = 18

Sl. No.	Supplementary Occupation	Small fish farmers		Large fish farmers	
		No.	Percentage	No.	Percentage
1.	Agriculture	6	30.00 (9.375)*	4	22.22 (7.14)*
2.	Agricultural Labour	8	40.00 (12.500)*	6	33.33 (10.71)*
3.	Caste occupation	2	10.00 (3.125)*	3	16.67 (5.36)*
4.	Fishing from river	4	20.00 (6.250)*	5	27.78 (8.93)*
	Total	**20**	**100.00 (31.250)***	**18**	**100.00 (31.67)***

* Percentage of total fish farmers.

Table 4.24 indicates the fish farming was main occupation of small number of the small fish farmers 20(31.75%) and 18(31.67%) large fish farmers. In that case, above table shows that other supplementary occupations were agriculture, agricultural labour, caste occupation and fishing from river, which were 6 (9.375%), 8(12.50%), 2(3.125%) and 4(31.25%) respectively in case of small fish farmers; and 4(7.14%), (10.17%), 3(5.36%) and 5(8.93%) respectively in case of large fish farmers.

4.3.1.6 Size of land holding of fish farmers:

The following table shows the size of land holding possessed by small and large fish farmers:

Table 4.25 Showing size of land holding of fish farmers

N (SF) = 64, N (LF) = 56

Sl. No.	Size of land holding in hectares (Interval)	Small fish farmers		Large fish farmers		Total	
		No.	%	No.	%	No.	%
1.	0 - 2	36	56.25	27	48.22	63	52.50
2.	2 - 4	12	18.75	16	28.57	28	23.33
3.	4 and above	4	6.25	5	8.93	9	7.50
4.	Landless	12	18.75	8	14.28	20	16.67
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**

Figures in the above table revealed that majority of the small fish farmers 48(75%) and large fish farmers 43(76.79%) were having land holding 0-4 hectares. There were small numbers of small fish farmers 4(6.25%) and large fish farmers 5(8.93%) who had land holding above 4 hectares. Data showed that 12(18.75%) small fish farmers and 8(14.28%) large fish farmers were landless.

Therefore, we may conclude that the majority of small fish farmers 48(75%) and large fish farmers 43 (76.79%) had land holding between 0 - 4 hectares.

To find out if there was a significant difference between small and large fish farmers regarding their land holding, the following null hypothesis (Ho) was tested.

Null Hypothesis (Ho):

There was no significant difference between small and large fish farmers as regards their size of land holding.

The following distribution of small and large fish farmers regarding their land holding given in the following table:

Table 4.26 Showing comparison of land holding of fish farmers

Sl. No.	Land holding	Small fish farmers	Large fish farmers	Total
1.	Lower land holding (0-2)	48	35	83
2.	Higher land holding (2 and above)	16	21	37
	Total	**64**	**56**	**120**

X^2 = 1.64 D.F. = 1, Non-significant at 0.05% level of significance.

The calculated value of x^2 was found to be 1.64, which was less than the table value of 3.84 at 0.05% level of significance for one degree of freedom. Therefore, the null hypothesis was accepted.

Therefore, it may be concluded that there was no significant difference between small and large fish farmers regarding their size of land holding. Both small and large fish farmers had the same size of land holding.

4.1.3.7 Family size of fish farmers:

The following table shows the family size of fish farmers

Table 4.27 Showing the family size of fish farmers

N (SF) = 64, N (LF) = 56

Sl. No.	Family Size (Interval)	Small fish farmers		Large fish farmers		Total	
		No.	%	No.	%	No.	%
1.	Small (2-5)	23	35.94	32	57.14	55	45.84
2.	Medium (6-9)	29	45.31	14	25.00	43	35.83
3.	Large (10-13)	12	18.75	10	17.86	22	18.33
	Total	**64**	**100.00**	**56**	**100.00**	**120**	**100.00**

Figures in the above table clarified that small fish farmers 29(45.31%) belonged to medium size

family and this was followed by 23(35.94%) of small fish farmers belonged to small family size and 12 (18.75%) small fish farmers who had large family.

Table 4.27 reflects that the large fish farmers 32(57.14%) belonged to small size family and this was followed by 14(25.00%) medium size and 10(17.86%) large size family in case of large fish farmers.

The average family size of small fish farmers was 8.23 and 6.98 in case of large fish farmers.

Therefore, we may conclude that most of the small and large fish farmers belong to medium family size.

To find out if there was a significant difference between small and large fish farmers as regards their family size, the following null hypothesis (Ho) was tested.

Null hypothesis (Ho):

There was no significant difference between small and large fish farmers as regards their family size.

The following distribution of small and large fish farmers regarding their family size are given in the following table:

Table 4.28 Showing comparison of family size of fish farmers:

Sl. No.	Family size	Small fish farmers	Large fish farmers	Total
1.	Small (2 - 6)	23	32	55
2.	Big (6 - 13)	41	24	65
	Total	**64**	**56**	**120**

x^2 = 4.59, D.F. = 1, significant at 0.05% level of significance.

The calculated value of x^2 was found to be 4.54 which was greater than the table value of 3.84 at 0.05% level of significance for one degree of freedom. Therefore, the null hypothesis was not accepted and hence the alternative hypothesis was accepted.

Therefore, it may be concluded that there was significant difference between small and large fish farmers regarding their family size. Large fish farmers had the small family than small fish farmers.

4.3.1.8 Socio-economic status of the fish farmers:

The socio-economic status of fish farmers was measured using the scale developed by measured using the scale developed by **Trivedi and Udai Pareek(1964).**

The score was computed and distribution of small and large fish farmers on socio-economic scale are given below.

Table 4.29 showing socio-economic status of fish farmers:

Sl. No.	Intervals socio-economic status (Scores)	Evaluation	Small fish farmers		Large fish farmers	
			No.	%	No.	%
1.	0 - 10	Low	27	42.19	16	28.57
2.	10 - 20	Medium	34	53.13	30	53.57
3.	20 - 29	High	3	4.68	10	17.86
	Total		**64**	**100.00**	**56**	**100.00**

As revealed from the above table, majority of small fish farmers 34(53.13%) and large fish farmers 30(53.57%) had medium socio-economic status. This was followed by 27(42.19%) small fish farmers and 16 (28.57%) large fish farmers who had low socio-economic status. There were 3(4.68%) small fish farmers in the high range and 10(17.86%) large fish farmers in the same group.

Therefore, we may conclude that most of the small and large fish farmers had medium socio-economic status.

To find out if there was a significant difference between small and large fish farmers as regards their socio-economic status, the following null hypothesis (Ho) was tested:

Null Hypothesis (Ho)

There was no significant difference between small and large fish farmers as regards their socio-economic status.

The following distribution of small and large fish farmers regarding their socio-economic status are given in the following table.

Table 4.30 showing socio-economic status of fish farmers:

N (SF) - 64, N (LF) - 56

Sl. No.	Score SF	Score LF	Sl. No.	Score SF	Score LF	Sl. No.	Score SF	Score LF	Sl. No.	Score SF	Score LF
1	7	22	17	16	13	33	12	11	49	19	6
2	3	16	18	9	14	34	7	21	50	20	7
3	16	15	19	3	11	35	12	12	51	19	23
4	6	11	20	5	15	36	13	7	52	19	17
5	4	13	21	6	7	37	15	11	53	6	24
6	8	6	22	11	21	38	9	8	54	24	19
7	5	11	23	13	17	39	11	8	55	16	21
8	4	23	24	15	8	40	4	14	56	16	8
9	6	5	25	16	15	41	18	13	57	23	-
10	7	11	26	15	22	42	16	17	58	17	-
11	3	16	27	8	16	43	8	7	59	16	-
12	6	4	28	13	6	44	15	12	60	11	-
13	4	12	29	9	13	45	13	9	61	17	-
14	12	15	30	14	22	46	14	16	62	7	-
15	3	13	31	5	7	47	18	13	63	14	-
16	3	21	32	22	8	48	19	11	64	12	-

Z = 0.34, Non significant at 5% level of significance.

The calculated value of Z was found to be 0.34 which was less than the table value of 'Z', (1.96) at 5% level of significance, hence the null hypothesis was accepted and hence the alternative hypothesis was rejected.

It may be concluded from the above table that there was no significant difference between small and large fish farmers regarding their socio-economic status. They had the same socio-economic status. This result reveals that farmers of small and large group are same as socio-economic scale but fish farming supplements to their total income.

4.2 ATTITUDE OF FISH FARMERS TOWARDS COMMUNITY FISH FARMING:

The study of attitude in this section is devoted for determining and comparing the attitude of small and large fish farmers towards community fish farming.

To determine the attitude of small and large fish farmers towards community fish farming, a set of 14 statements was used. Responses were recorded on a five point scale of strongly Agree, Agree, Undecided, Disagree, Strongly disagree. The scoring was 5-1 in case of positive sentences and 1-5 in case of negative sentences.

The attitude scores of small and large fish farmers on each sentence are discussed below:

4.2.1 Attitude on "Community Fish Farming can best be done only by the Mallah Community"

The relevant data are presented in Table 4.31

TABLE 4.31 Showing attitude on "community fish farming can best be done only by the mallah community"

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	10	15.6	8	14.29
2.	Agree	12	18.8	10	17.86
3.	Undecided	0	0.00	2	3.57
4.	Disagree	24	37.5	20	35.71
5.	Strongly disagree	18	28.1	16	28.57
	Total	64	100.00	56	100.00

It is obvious from the above table that 2/3 of small fish farmers 42(65.6%) and more than half of large fish farmers 36(64.28%) were "strongly disagree" or "simply disagree" on this sentence, showing that they were not convinced that fish farmers could best be done only "Mallah" community. There were some small fish farmers 22(34.4%) and large fish farmers 18(32.15%) who were "strongly agreed" or "simply agreed" on this sentence showing that they thought that community fish farming could best be done only by the "Mallah" Community.

Therefore, we may conclude that there were 2/3rd small fish farmers 42(65.6%) and than half of large fish farmers 36(64.28%) were "strongly disagreed" or

"simply disagreed" on this point, meaning thereby that community fish farming need not be done only by the "Mallah" community. Others also can do it.

4.2.2 Attitude on "the present procedure of granting patta (lease) to fish farmer is satisfactory and need no improvement"

The relevant data in this connection are tabulated in the following table.

Table 4.32 Showing attitude on "the present procedure of granting patta (lease) to fish farmer is satisfactory and need no improvement."

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	0	0.00	1	1.79
2.	Agree	6	9.38	4	7.14
3.	Undecided	8	12.5	5	8.93
4.	Disagree	33	51.56	37	66.07
5.	Strongly disagree	17	26.56	9	16.07
	Total	**64**	**100.00**	**56**	**100.00**

It is clear from table 4.32 that more than 3/4th of small fish farmers 50(78.12%) and large fish farmers 46(82.14%) were "strongly disagreed" or "simply disagreed" on this statement. It showed that the present procedure of granting "patttas" to fish farmers was not satisfactory and needed improvement. However, there was a small number of small fish

farmers 6(9.38%) who were "simply agreed" and a small number of large fish farmers 5(8.93%) were "strongly agreed" or "simply agreed" on this statement, showing that the present procedure of granting "Pattas" (lease) to fish farmers is satisfactory and need no improvement.

Therefore, it may be concluded from the above that majority of small fish farmers 50(78.12%) and large fish farmers 46(82.14%) were not agreed on the present procedure of granting "Pattas". They felt that it should be modified and should best be done through the auspices of the Gram Panchayat.

4.2.3 Attitude towards the statement that "The supply of inputs like fingerlings and feeds etc. is timely and adequate"

The relevant data in this connection are presented in the following table.

Table 4.33 **Showing attitude towards the statement that "the supply of input like fingerlings and feeds etc. is timely and adequate"**

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	7	10.94	19	33.93
2.	Agree	15	23.44	27	48.21
3.	Undecided	17	26.56	3	5.36
4.	Disagree	20	31.25	5	8.93
5.	Strongly disagree	5	7.81	2	3.57
	Total	**64**	**100.00**	**56**	**100.00**

From the above table it was obvious that majority of small fish farmers 25(39.06%) and small number of large fish farmers 7(12.50%) were "strongly disagreed" or "simply disagree" on this statement, showing that they felt that supply of inputs for fish farming was not timely and adequate. A small number of large fish farmers 3(5.36%) and small fish farmers 17(25.56%) were undecided on this statement. It showed that they were not convinced that supply of inputs for fish farmers was timely and adequate. Majority of large fish farmers 46(82.14%) and small numbers of small fish farmers 27(34.38%) were "strongly agreed" or simply "agreed" on this

sentence, showing that they felt that supply of inputs for fish farming was timely and adequate.

Therefore, it may be concluded from above that majority of large fish farmers 46(82.14%) were agreed on this statement that "the supply of input like fingerlings and feeds etc. is timely and adequate", whereas a substantial number of small fish farmers 42 (65.6%) were either undecided or disagree.

4.2.4 Attitude on "Community fish farming system (C.F.F. system) is not successful because village community pond is used for other purpose also"

The relevant data in this connection are tabulated in the following table:

Table 4.34 **Showing attitude on "C.F.F. system is not successful because village community pond is used for other purpose also."**

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	**%**	**No.**	**%**
1.	Strongly Agree	1	1.56	0	0.00
2.	Agree	5	7.81	7	12.50
3.	Undecided	4	6.25	3	5.36
4.	Disagree	35	54.69	31	55.36
5.	Strongly disagree	19	29.69	15	26.78
	Total	**64**	**100.00**	**56**	**100.00**

It is significant to note that a great number of small fish farmers 54(84.38%) and large fish farmers 46(82.14%) were either "strongly disagree" or "simply disagree" on this issue, showing that they were not convinced that C.F.F. system is not successful because village community pond is used for other purpose also. Only small number of small fish farmers 6(9.37%) and small number of large fish farmers 7(12.50%) were either "strongly agree" or simply "agree" on this issue.

Therefore, it may be concluded that majority of both small and large fish farmers were disagree on this statement. They were not convinced that Community fish farming is not successful because village community pond is used for other purpose also.

4.2.5 **Attitude towards the statement that "Taking loan for fish farmers is a complicated process and hence every one cannot avail of it"**

The data in this connection are presented below:

TABLE 4.35 Showing attitude on "taking loan for fish farmers is a complicated process and hence every one can not avail of it"

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	14	21.88	3	5.36
2.	Agree	37	57.81	11	19.64
3.	Undecided	5	7.81	6	10.71
4.	Disagree	5	7.81	23	41.07
5.	Strongly disagree	3	4.69	13	23.22
	Total	64	100.00	56	100.00

The above data showed that majority of small fish farmers 51(79.69%) and only some of large fish farmers 14(25.00%) were "strongly agreed" or simply "agree" on this statement. This showed that they were not convinced that loans were easily available for fish farming.

There were small number of small fish farmers 8 (12.5%) and large number of large fish farmers 36 (64.29%) who were "strongly disagreed" or simply "disagreed" on this statement, showing that they were convinced that loans were easily available for fish farming.

4.2.6 <u>Attitude on Community fish farming is only for rich and influential people of village"</u>

Table 4.36 Showing attitude on "community fish farming is only for rich and influential people of village"

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	02	3.13	3	5.36
2.	Agree	12	18.75	14	25.00
3.	Undecided	00	00.00	0	00.00
4.	Disagree	39	60.94	28	50.00
5.	Strongly disagree	11	17.19	11	19.64
	Total	**64**	**100.00**	**56**	**100.00**

It was evident from above that overwhelming number of small fish farmers 50(78.13%) and large fish farmers 39(69.64%) were either "strongly disagreed" or simply "disagreed" on this sentence, meaning thereby that not only rich and influential people but others also benefiting from community fish farming.

A substantial number of small fish farmers 14 (21.88%) and large fish farmers 17(30.36%) were either "strongly agreed" or simply "agreed" meaning that only rich and influential people benefited from fish farming.

Therefore, we may conclude that a great majority of small fish farmers 50(78.13%) and large fish farmers 39(69.64%) thought that every one and not only rich and influential people are benefiting from community fish farming.

4.2.7 Attitude towards the statement that "training from F.F.D.As. has helped fish farmers in better yield."

The relevant data are presented below :

Table 4.37 Showing attitude on "training from F.F.D.As have helped fish farmers in better yield"

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	38	59.38	32	57.14
2.	Agree	21	32.81	19	33.93
3.	Undecided	2	3.13	3	5.36
4.	Disagree	3	4.69	2	3.57
5.	Strongly disagree	0	0.00	0	0.00
	Total	**64**	**100.00**	**56**	**100.00**

It was observed from above that majority of small fish farmers 59(92.19%) and majority of large fish farmers 51(91.07%) were "strongly agreed" or simply "agreed" on this sentence. It showed that they felt that training from F.F.D.A. has helped farmers

in better yield. There were only small number of small fish farmers 3(4.69%) and large fish farmers 3 (3.57%) disagreed on this statement. It showed that they did not feel that training from F.F.D.A. has helped fish farmers in better yield.

It may be concluded that larger number of small and large fish farmers were agreed on this issue, meaning thereby that they felt that training from F.F.D.A. has helped fish farmers in better yield.

4.2.8 Attitude towards the statement that "community fish farming is a risky and complicated affair"

The relevant data in this connection are presented in the following table"

Table 4.38 Showing attitude on "community fishfarming is a risky and complicated affair"

(SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	0	0.00	2	5.36
2.	Agree	12	18.75	10	17.86
3.	Undecided	8	12.50	7	12.50
4.	Disagree	29	45.31	24	42.85
5.	Strongly disagree	15	23.44	12	21.43
	Total	64	100.00	56	100.00

It is revealed that overwhelming number of small fish farmers 44(68.75%) and majority of large fish farmers 36(64.28%) were "strongly disagreed" or simply "disagreed" on the above statement, showing that they did not think that fish farmers was a risky and complicated affair. Only 12(18.75%) of small fish farmers and 12(21.42%) of large fish farmers agreed the statement. It shows that they thought that community fish farming was a risky and complicated affair. Small fish farmers 8(12.50%) and large fish farmers 7(12.50%) were undecided meaning that they had no clear-cut opinion about risk in community fish farming.

Therefore, it may be concluded that the majority of small fish farmers 44(68.75%) and majority of large fish farmers 36(64.28%) were of the opinion that fish farmers is a good enterprise besides some risks but not a complicated affair.

4.2.9 Attitude towards the statement that "marketing facilities for fish farmers are inadequate and need improvement"

The relevant data in this connection are tabulated below:

Table 4.39 showing attitude on "marketing facilities for fish farmers are inadequate and need improvement"

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	32	50.00	26	46.43
2.	Agree	12	18.75	20	35.41
3.	Undecided	8	12.50	5	8.93
4.	Disagree	10	15.62	3	5.36
5.	Strongly disagree	2	3.13	2	5.57
	Total	**64**	**100.00**	**56**	**100.00**

It is clear from above table that an overwhelming number of small fish farmers 44(68.75%) and 46(82.14%) of large fish farmers were "strongly agreed" or simply "agreed" on this statement. It showed that they felt that marketing facilities for fish farmers were inadequate and need improvement. There were small number of small fish farmers 12 (18.75%) and some 5(8.93%) who were "disagreed" on this statement, showing that marketing facilities for fish farmers were adequate and no need of improvement. There were a small number 8(12.50%) of small fish farmers and 5(8.93%) of large fish farmers who were undecided, meaning that they had no clear

opinion about the marketing facilities for fish farmers because they sell fish in farm gate.

Therefore, it may be concluded that majority of small fish farmers 44(68.75%) and large number of large fish farmers 46(82.14%) were found to be unsatisfied with the available marketing facilities. The number of those who agreed on this was insignificant in number.

4.2.10 Attitude on "Community fish farming is profitable enterprise"

The relevant data are presented below:

Table 4.40 Showing attitude towards the statement that "community fish farming is profitable enterprise"

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	39	60.94	19	33.93
2.	Agree	12	18.75	32	57.14
3.	Undecided	11	17.19	3	5.36
4.	Disagree	2	3.13	2	3.57
5.	Strongly disagree	0	0.00	0	0.00
	Total	**64**	**100.00**	**56**	**100.00**

It is observed from the table that large number of small fish farmers 51(79.69%) and great majority of large fish farmers 51(91.07%) were "strongly

agreed" or simply "agreed" on the statement showing that they were convinced that community fish farming is a profitable enterprise. Only few of small fish farmers 2(3.13%) and 2(3.57%) of large fish farmers disagreed with this statement. Some small fish farmers 4(17.19%) and few of large fish farmers 3(5.36%) were undecided meaning that they had no clear-cut opinion about profitability of C.F.F.

From the above interpretation, we may conclude that community fish farming is a profitable enterprise.

4.2.11 <u>Attitude towards the statement "Fish farming is a must to supplement the improvement of diet of the people"</u>

The relevant data are presented below:

Table 4.41 **Showing attitude on "fish farming is a must to supplement the improvement of diet of the people".**

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	8	12.50	3	5.36
2.	Agree	12	18.75	14	25.00
3.	Undecided	29	45.31	28	50.00
4.	Disagree	15	23.44	11	19.64
5.	Strongly disagree	0	0.00	0	0.00
	Total	**64**	**100.00**	**56**	**100.00**

The above data shows that majority of small fish farmers 29(45.31%) and sufficient number of large fish farmers 28 (50.00%) who were undecided meaning that they had no clear-cut opinion on this point. Table shows that some number of small fish farmers 20 (31.25%) and substantial number of large fish farmers 17(30.36%) were "strongly agreed" or simply "agreed" on this statement. It showed that they were convinced that fish farming was a must to supplement the improvised diet of the people. However, small number of small fish farmers 15(23.44%) and a few number of large fish farmers 11(19.64%) who were "disagreed" on this statement, showing that fish farming was not necessary to supplement the improvised diet of the people.

Therefore, we may conclude that majority of small fish farmers 29(45.31%) and sufficient number 28(50.00%) of large fish farmers who were undecided meaning that they had no clear cut idea about improvement of diet through fish farming.

4.2.12 Attitude towards the statement that "Facilities provided by F.F.D.A. are enough"

Table 4.42 Showing attitude on "facilities provided by F.F.D.As are enough"

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	0	0.00	11	19.64
2.	Agree	17	26.56	23	41.07
3.	Undecided	33	51.56	6	10.71
4.	Disagree	8	12.5	13	23.22
5.	Strongly disagree	6	9.38	3	5.36
	Total	**64**	**100.00**	**56**	**100.00**

It was observed from above that a number of small fish farmers 17(26.56%) and majority of large fish farmers 34(60.71%) were "strongly agreed" or "agreed" on this statement, showing that they felt that facilities provided by the F.F.D.A. were enough. There were a substantial number of small fish farmers 14(21.88%) and large fish farmers of 16(28.58%) who were strongly disagree or simply disagree on this statement. This shows that they felt that facilities provided by F.F.D.A. were not enough.

Therefore, it may be concluded that majority of large fish farmers 34(60.71%) and small number of small fish farmers 17(26.56%) were of the opinion that facilities provided by the F.F.D.A. were enough. The majority of small fish farmers 33(51.56%) who were undecided shows that they had no knowledge or little knowledge about the facilities provided by the F.F.D.A.

4.2.12 Attitude towards the statement that "Even people of high caste can successfully adopt community fish farming

Table 4.43 Showing attitude on "even people of high caste can successfully adopt community fish farming

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	12	18.75	31	55.36
2.	Agree	32	50.00	15	26.78
3.	Undecided	10	15.62	3	5.36
4.	Disagree	8	12.50	7	12.50
5.	Strongly disagree	2	3.13	0	0.00
	Total	**64**	**100.00**	**56**	**100.00**

It was evident from above table that a greater majority of small fish farmers 44(68.75%) and great number of large fish farmers 46(82.14%) were strongly agreed or simply agreed on this issue. It shows that

they felt that people of high caste can successfully adopt community fish farming. Small number of small fish farmers 12(15.63%) and a few number of large fish farmers 7(12.50%) were disagreed or strongly disagreed, showing that they felt that high caste people cannot successfully adopt community fish farming.

It may be concluded that greater majority of small fish farmers 44(68.75%) and great number of large fish farmers 46(82.14%) were of the opinion that people of high caste can successfully adopt community fish farming.

4.2.14 Attitude towards the statement that "The loans given for fish farming are not being regularly recovered"

The relevant data are present in the table 4.44

Table 4.44 Showing attitude on the loans given for fish farming are not being regularly recovered

N (SF) = 64, N (LF) = 56

Sl. No.	Responses	Small fish farmers		Large fish farmers	
		No.	%	No.	%
1.	Strongly Agree	8	12.50	20	35.71
2.	Agree	12	18.75	16	28.57
3.	Undecided	29	45.31	12	21.43
4.	Disagree	15	20.31	5	8.93
5.	Strongly disagree	2	3.13	3	5.36
	Total	**64**	**100.00**	**56**	**100.00**

It is clear from the above table that some number of small fish farmers 20(31.25%) and more than half of large fish farmers 36(64.29%) were "strongly agreed" or simply "agreed" on this statement, showing that the loans given for fish farmers are not being regularly recovered. A few number of large fish farmers 7(13.99%) and some small fish farmers 17 (23.44%) were strongly disagree or simply disagree the statement, showing that fish farmers recovered loan regularly. Greater number of small fish farmers 29(45.31%) and few large fish farmers 12(21.43%) who were undecided the statement, meaning that they had no knowledge about loan recovery in fish farming.

Therefore, we may conclude that a some number of small fish farmers 20(31.25%) and more than half of large fish farmers 36(64.29%) were agreed on this statement. It showed that they felt that the loans given for fish farming were not being regularly recovered.

4.2.15 Summary of attitude of fish farmers towards community fish farming (C.F.F.)

Responses on all sentences were assigned numerical weight as strongly Agree-5, Agree-4, Undecided-3, Disagree-2, Strongly disagree-1 in case

of positive sentence and strongly agree-1, Agree-2, undecided-3, Disagree-4, Strongly disagree-5, in case of negative sentence.

Thus based on all responses a total score was computed for each sentence. Dividing the total score of each sentence by the number of fish farmers a mean weighted score (MWS) was computed for each of fourteen sentences. These mean weighted scores were evaluated by the following criteria.

Positive Statements	Evaluation	Negative statements
Strongly disagree	1.0 - 1.8	Strongly Agree
Disagree	1.8 - 2.6	Agree
Undecided	2.6 - 3.4	Undecided
Agree	3.4 - 4.2	Disagree
Strongly agree	4.2 - 5.0	Strongly disagree

The total scope of each sentence the corresponding mean weighted scores (MWS) and its evaluation are shown in the table No. 4.45

Table 4.45 showing summary of responses towards fish farmers on all statements along with total scores, mean weighted scores (M.W.Ss.) and their evaluation

(SF) = 64, N (LF) = 56

Sl. No.	Statements	Small fish farmers			Large fish farmers		
		TS	TWS	EVA	TS	TWS	EVA
1	2	3	4	5	6	7	8
1.	Community fish farmers can best be done only by "Mallah" community.	220	3.44	DA	214	3.82	DA
2.	The Present procedure of granting Patta (Lease) to fish farmers is satisfactory and need no improvement.	131	2.05	DA	119	2.13	DA
3.	The supply of inputs like fingerling and feeds etc. is timely and adequate.	191	2.98	UD	224	4.0	A
4.	Community fish farming system is not successful because village community pond is used for other purpose also.	257	4.03	DA	234	4.18	DA
5.	Taking loan for fish farming is a complicated process and hence every one cannot avail it.	152	2.36	A	200	3.57	DA
6.	Community fish farming is only for rich and influential people of village.	237	3.7	DA	198	3.54	DA
7.	Training from F.F.D.A. has helped fish farmers in better yield	283	4.42	SA	249	4.45	SA
8.	Community fish farming is a risky and complicated affair.	239	3.73	DA	200	3.57	DA

Cont....

Cont....

Sl. No.	Statements	Small fish farmers			Large fish farmers		
		TS	TWS	EVA	TS	TWS	EVA
1	2	3	4	5	6	7	8
9.	Marketing facilities for fish farming are inadequate and need improvement	130	2.03	A	103	1.84	A
10.	Community fish farming is a profitable enterprise.	280	4.38	SA	286	4.21	SA
11.	Fish farming is a must to supplement the improvement of diet of the people	205	3.2	UD	177	3.16	UD
12.	Facilities provided by F.F.D.A. are enough	189	2.95	UD	194	3.46	A
13.	Even people of high caste can successfully adopt community fish farming	236	3.69	A	238	4.25	SA
14.	The loans given for fish farming are not being regularly recovered.	181	2.83	UD	123	2.2	A

4.2.15.1 <u>Small fish farmers were strongly agreed or simply agreed on the following statements</u>

1. Taking loan for fish farming is a complicated process and hence every one cannot avail of it;
2. Training from F.F.D.A. has helped fish farmers in better yield;
3. Marketing facilities for fish farming are inadequate and need improvement.
4. Community fish farming is a profitable enterprise.
5. Even people of high caste can successfully adopt community fish farming

Small fish farmers were either strongly disagreed or simply disagreed on the following statements:

1. Community fish farming can be best done only by the "Mallah" community;
2. The present procedure of granting Patta (Lease) to fish farmers is satisfactory and need no improvement.
3. Community fish farming system is not successful because village community ponds are used for other purpose also.
4. Community fish farming is only for rich and influential people of the village.
5. Community fish farming is a risky and complicated affair.

4.2.15.2 Small fish farmers were undecided on the following statements:

1. The supply of inputs like fingerlings and feeds etc is timely and adequate.
2. Fish farming a must to supplement the improvement of diet of the people.
3. Facilities provided by F.F.D.A. are enough.
4. The loan given for fish farmers are not being regularly recovered.

4.2.15.3 **Large fish farmers were either strongly agreed or simply agreed on the following statements:**

1. The supply of inputs like fingerlings and feeds etc. is timely and adequate.
2. Training from F.F.D.A. has helped fish farmers in better yield.
3. Marketing facilities for fish farming are inadequate and need improvement.
4. Community fish farming is a profitable enterprise.
5. Facilities provided by F.F.D.A. are enough.
6. Even people of high caste can successfully adopt community fish farming.
7. The loans given for fish farming are not being recovered.

4.2.15.4 **Large fish farmers were strongly disagreed or simply disagreed on the following statements:**

1. Community fish farming can be best done by the "Mallah" community only.
2. The present procedure of granting Patta (Lease) to fish farmers is satisfactory and need no improvement.

3. Community fish farming system is not successful because village community ponds are used for other purpose also.
4. Taking loan for fish farming is a complicated process and hence every one cannot avail it.
5. Community fish farming is only for rich and influential people of village.
6. Community fish farming is a risky and complicated affair.

4.2.15.5 **Large fish farmers were undecided on the following statements:**

1. Fish farming is a must to supplement the improvement diet of the people.

To find out if there was a significant difference among small and large fish farmers regarding their attitude towards community fish farming, the following null hypothesis (Ho) was tested.

Null Hypothesis (Ho):

There was no significant difference between small and large fish farmers on their attitude towards fish farming.

The distribution of small and large fish farmers regarding their attitude on fish farming are given in the following table:

Table 4.46 Showing attitude scores of fish farmers

(SF) = 64, N (LF) = 56

Sl. No.	Score		Sl. No.	Score		Sl. No.	Score		Sl. No.	Score	
	SF	LF		SF	LF		SF	LF		SF	LF
1	47	53	17	38	46	33	50	52	49	47	50
2	43	44	18	50	55	34	45	53	50	59	49
3	45	48	19	47	49	35	51	47	51	45	45
4	50	39	20	45	43	36	42	48	52	42	52
5	45	38	21	42	53	37	38	49	53	48	40
6	28	48	22	49	45	38	55	45	54	49	53
7	52	44	23	47	48	39	40	57	55	54	57
8	39	54	24	48	42	40	43	41	56	45	49
9	47	46	25	46	49	41	51	54	57	33	-
10	42	43	26	48	42	42	49	47	58	54	-
11	45	55	27	49	53	43	36	46	59	42	-
12	35	51	28	41	48	44	52	49	60	48	-
13	52	47	29	42	52	45	47	47	61	57	-
14	46	49	30	52	43	46	54	52	62	46	-
15	43	49	31	41	51	47	43	48	63	39	-
16	39	37	32	46	49	48	52	47	64	33	-

Z = 0.42, Non significant at 5% level of significance

The calculated value of 'Z' was found to be 0.42, which was lowest than the table value of 'Z' (1.96) at 5% level of significance. Hence, the null hypothesis (Ho) was accepted. This shows that both small and large fish farmers had favourable attitude about community fish farming.

4.3 DEVELOPMENT OF FALLOW, UNPRODUCTIVE AND MARGINALLY PRODUCTIVE LANDS AND EMPLOYMENT GENERATION:

This section deals with conversion of land- both fallow agricultural wasteland and water logged areas into income generating and employment generating sector through fish culture. This section is fulfilling the third objective set up in the study.

4.3.1 Development of existing water area in study area:

Development of water area started in last two decades. Water area is either unutilised or is used only for Singhara (water-nut) and Makhana production. According to F.F.D.A. 100 hectares of water area has been developed each year.

Table 4.47 gives the details about development of existing water area (unproductive and marginally productive) to fish ponds in the study area:

Table 4.47 Development of existing water area (unproductive and marginally productive) to fish ponds in study area

Sl. No.	Particulars	Small ponds		Large Ponds		Total	
		No.	Area (ha)	No.	Area (ha)	No.	Area (ha)
1.	Unproductive water-logged area converted into fish ponds	23	16.20	11	14.60	34	30.80
2.	Marginally productive water-logged area converted into fish ponds	31	19.78	29	39.22	60	59.00
	TOTAL	**54**	**35.98**	**40**	**53.82**	**94**	**89.80**

The table 4.47 shows the development of existing water areas to fishponds. Total 34 unproductive ponds converted into fishponds, of which 23 were small ponds covering an area of 16.2 ha and 11 were large ponds covering an area of 14.6 ha in the selected villages of the study area.

The table also points out that 31 small marginally productive waterlogged areas measuring 19.78 ha were converted into fishponds and 29 large marginally productive waterlogged areas measuring 39.22 ha were also converted into fishponds in the selected villages of study area. Total 94 waterlogged areas were converted into fishponds, which became source of income and employment to rural people.

4.3.2 Types of development of existing ponds in the study area:

Table 4.48 shows the types of development of existing ponds in the study area.

Table 4.48 Types of development of existing ponds in the study area

Sl. No.	Particulars	Small ponds		Large Ponds		Total	
		No.	Area (ha)	No.	Area (ha)	No.	Area (ha)
1.	**PARTIAL DEVELOPMENT:**						
A.	Removal of aquatic weeds and wild fish	23	14.20	29	35.12	52	49.32
B.	Maintenance of embankment	24	16.64	6	10.60	30	27.24
2.	**PARTIAL DEVELOPMENT WITH BORING**	7	5.14	5	8.10	12	13.24
	TOTAL	**54**	**35.98**	**40**	**53.82**	**94**	**89.80**

Table 4.48 shows that there are two types of development which took place in the existing ponds of villages: 1. Partial development; and 2. Partial development with boring. Partial development is also categorised into two, viz. a. Removal of aquatic submerged weeds and wild fish (economically unimportant); and b. Maintenance of pond embankment or bundh.

23 small ponds with a total water area of 14.20 ha were partially developed by removing the submerged aquatic weed and wild economically unimportant

fishes, whereas in case of large ponds 29 ponds with 35.12 ha water area were partially developed by removing the aquatic weeds and wild fishes.

24 small ponds covering total water area of 16.64 ha while large ponds covering 10.60 ha water area were also developed by maintaining embankment or bundh.

7 small ponds covering an area of 5.14 ha were partially developed with boring and 5 large ponds covering 8.10 ha water area were developed by partial boring.

It shows that the village community ponds which were unproductive and marginally productive, were converted into productive fishponds and gave better environment to villages as well as better income.

4.3.3 Development of fallow agriculturally wasteland converted to new fishponds:

The data were collected from the selected villages of study area. These ponds were personal ponds and not community ponds. So economic and other studies could not be undertaken in this study.

Table 4.49 Development of fallow agriculturally wasteland converted to new ponds for fish farming

Sl. No.	Particulars	Small ponds		Large Ponds		Total	
		No.	Area (ha)	No.	Area (ha)	No.	Area (ha)
1.	Fallow land converted into new fishponds*	6	4.61	5	6.64	11	11.25
2.	Fallow land converted into fish seed hatchery (mini hatchery)**	-	-	-	-	1	4.00

* These ponds were personal ponds, not community ponds. Data were collected from only selected villages of study area.

** Sardsani mini hatchery present in Jasra block of Jamunapar region of Allahabad district.

Table 4.49 shows that a total of 11 new ponds were constructed in the selected village covering 11.25 ha water area. Fallow land converted into fish seed hatchery covering water area of 4.00 ha, which supplies seed to fish farmers of Allahabad district and neighbouring districts also.

4.3.4 Employment pattern in community fish farming system:

Table 4.50 shows the details about employment pattern in community fish farming system of study area. Average man-days generated/ha/year from small ponds were 28.75 days and 66.12 days for casual

workers and permanent workers (family) respectively, and 51.84 days and 68.62 days for casual workers and permanent workers (family) respectively from large ponds. Here, it was found that more days of casual level workers worked in large fishponds than in small ponds.

Table 4.50 Employment pattern in community fish farming system of study area

Sl. No.	Particulars	Small ponds			Large ponds		
		Casual Worker Hired	Permanent Workers Family	Total	Casual Worker Hired	Permanent Workers Family	Total
1.	Average man-days generated/ha/year from ponds	28.75	66.12	94.87	51.84	68.62	120.43
2.	Average hours worked per day/ha *	0.76	1.76	2.52	1.38	1.82	3.20
3.	Total mandays generated per year due to development of existing ponds (unproductive & marginally productive)	1034.43	2379.0	3413.43	2790.0	3693.13	6483.13

* Where total working days in a year were 300.

0.76 hours and 1.76 hours Casual workers and permanent workers respectively worked per day / ha in case of small ponds, whereas 1.38 hours and 1.82

hours casual and permanent workers respectively worked in large ponds. It shows that fish farming is good as supplementary (secondary) occupation.

Total mandays generated per year due to development of existing ponds were 3413.43 mandays and 6483.13 mandays for small and large ponds, respectively.

From the above table it can be concluded that fish farming is good source of employment for rural people. They adopt it as supplementary source of employment beside other primary occupations.

4.4 ECONOMICS OF COMMUNITY FISH FARMING:

The study of the effect of stocking density and stocking size on the production and economics of carp under semi intensive culture was conducted and comparison of economics between small ponds and large ponds were carried out. No such studies were carried earlier at this place. This section is fulfilling the fourth and fifth objectives set up in the study.

For comparing the economics of fish culture with different stocking sizes and stocking densities, the crops were grouped into four categories based on stocking density and stocking size, separately for small ponds and large ponds. For small fishponds, the four categories of rates and size were:

a. Fry stage with stocking density 10,000 - 20,000/ha/year **(SPA)**;

b. Fry stage with stocking density 20,001 and above/ha/year **(SPB)**;

c. Fingerling stage with stocking density 5,000 - 8,000/ha/year **(SPC)**; and

d. Fingerling stage with stocking density 8,001 and above/ha/year **(SPD)**

The four categories for large size ponds were at stocking rates and sizes:

a. Fry stage with stocking density 10,000 - 20,000/ha/year **(LPA)**;

b. Fry stage with stocking density 20,001 and above/ha/year **(LPB)**;

c. Fingerling stage with stocking density 5,000 - 8,000/ha/year **(LPC)**; and

d. Fingerling stage with stocking density 8,001 and above/ha/year **(LPD)**

Details of cost of production of fish under different stocking density and stocking size in C.F.F. System is given in table 4.51

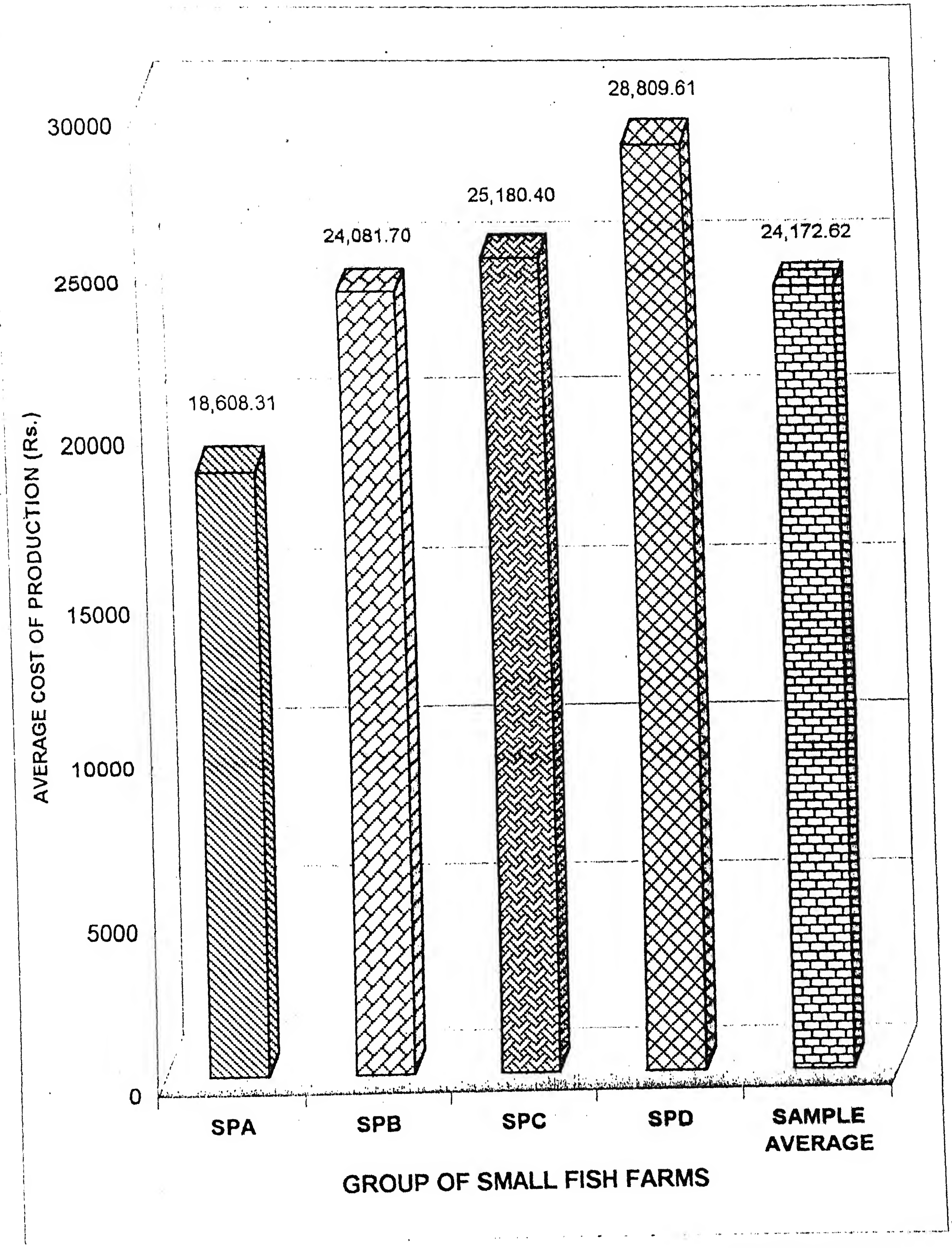
TABLE 4.51

Details of cost of production of fish under different stocking density and stocking size in C.F.F. System of study area (Small Ponds)

Sl. No.	Particulars	Rs. / ha / year in small ponds				
		SP-A	SP-B	SP-C	SP-D	**Sample Average**
		Fry stage	Fry stage	Fingerlings	Fingerlings	
		10,000 - 20,000	20,001and above	5,000 - 8,000	8,001 and above	
I.	**FIXED COST :**					
	i. Rent Amount	951.56	807.81	962.50	943.75	916.41
		5.11%	*3.35%*	*3.83%*	*3.28%*	*3.79%*
	ii. Interest on fixed cost	85.64	72.70	86.63	84.94	82.48
		0.46%	*0.30%*	*0.34%*	*0.29%*	*0.34%*
A.	**Total Fixed Cost**	**1037.20**	**880.51**	**1049.13**	**1028.69**	**998.89**
		5.57%	*3.66%*	*4.17%*	*3.57%*	*4.13%*
II.	**VARIABLE COST :**					
	i. Cost of Lime	954.38	1028.13	989.06	1060.94	1008.13
		5.13%	*4.27%*	*3.93%*	*3.68%*	*4.17%*
	ii. Cost of Manure	2765.63	3191.25	3293.75	3434.38	3171.25
		14.86%	*13.25%*	*13.08%*	*11.91%*	*13.12%*
	iii. Cost of Seed	1959.06	2803.13	4371.88	4681.25	3453.83
		10.53%	*11.64%*	*17.36%*	*16.25%*	*14.29%*
	iv. Cost of Feed	3099.06	4768.13	4993.75	5693.75	4638.67
		16.66%	*19.80%*	*19.83%*	*19.76%*	*19.19%*
	v. Cost of Hired Labour	1130.00	1276.25	1354.38	1415.00	1293.91
		6.07%	*5.30%*	*5.37%*	*4.91%*	*5.35%*
	vi. Cost of Family Labour	2780.00	2840.63	3103.13	3177.50	2975.32
		14.94%	*11.80%*	*12.32%*	*11.03%*	*12.31%*
	vii. Cost of Harvesting	1643.75	2378.13	1665.63	2393.75	2020.31
		8.83%	*9.88%*	*6.61%*	*8.31%*	*8.36%*
	viii. Misc. Expenses	815.63	1724.38	1031.25	2092.50	1415.94
		4.38%	*7.16%*	*4.10%*	*7.26%*	*5.86%*
	ix. Interest on Working Capital @16%	2423.60	3200.16	3328.45	3831.85	3196.02
		13.02%	*13.29%*	*13.22%*	*13.30%*	*13.22%*
B.	**Total Variable Cost**	**17571.11**	**23201.19**	**24131.28**	**27780.92**	**23173.38**
		94.43%	*96.34%*	*95.83%*	*96.43%*	*95.82%*
C.	**TOTAL COST (A+B)**	**18608.31**	**24081.70**	**25180.41**	**28809.61**	**24172.26**
		100%	*100%*	*100%*	*100%*	*100%*

FIGURES SHOWN IN ITALICS, SHOWS THE PERCENTAGE OF TOTAL COST OF PRODUCTION

FIGURE 4.1 AVERAGE COST OF PRODUCTION (Rs.) IN DIFFERENT STOCKING SIZE AND STOCKING DENSITY GROUPS IN SMALL FISH FARMS IN C.F.F. SYSTEM



Source : Survey

4.4.1 Cost of production of fish under different stocking density and stocking size in community fish farming in small ponds:

The costs of fish culture at the different stocking densities and stocking sizes in small fish farms are given in table 4.51

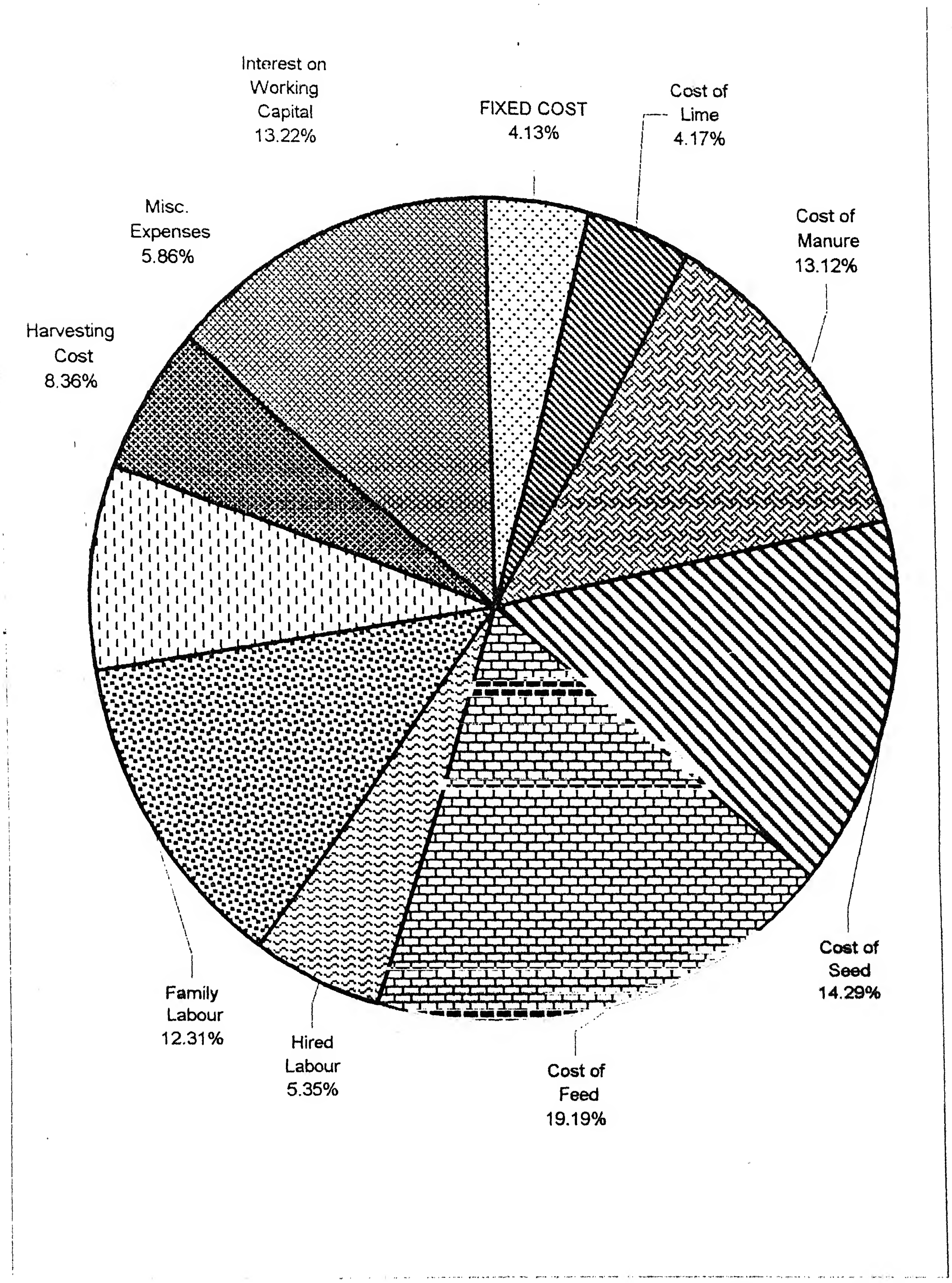
The total fixed cost for the culture of carps in small ponds for the SPA, SPB, SPC and SPD categories were Rs. 1037.20, Rs. 880.51, Rs. 1049.12 and Rs. 1028.69/ha/year, respectively. The sample average was Rs. 998.89/ha/year. These constituted 5.57%, 3.65%, 4.17% and 3.57% of total cost respectively. The total variable cost for the first group SPA was Rs. 17,571.11/ha/year, out of which 16.66% went towards the cost of feed; for the second group SPB, the total variable cost was Rs. 23,201.19/ha/year, of which 19.79% was spent towards feed. Hence, it is evident that in same stocking size (fry stage) as the stocking density increased, the total variable cost also increased and feeding cost also increased. It is also found that the cost of seed also increased from 10.53% in case of SPA to 11.64% in case of SPB. (Fig. 4.1)

The total variable cost for the third group SPC was Rs. 24,131.28/ha/year, out of which 19.83% went towards cost of feed; for the fourth group SPD, the total variable cost was Rs. 27,780.92/ha/year out of which 19.76% was spent towards feed. Hence, it is evident that in same stocking size (fingerlings) as the stocking density increased, the total variable cost also increased, but feeding cost slightly decreased in fourth group SPD because for proper management of fish ponds, the SPD fish farmers harvest fish in between the final harvest which help in decreasing the feeding cost in fourth group.

In case of 3rd and 4th groups, seed cost also increased, which were Rs. 4371.88 and Rs. 4681.25 respectively.

From the table 4.51, it is found that the cost of manure increased but percentage of total cost of manure decreased with the stocking density. In case of fry stage stocking SPA and SPB, cost of manure was Rs.2765.63/ha/year and Rs. 3191.25/ha/year respectively, which constituted 14.86% and 13.25% of the total cost respectively. This indicates that farmers pay more for supplementary feed than the manure,

Figure 4.2 COMPONENT WISE COST OF PRODUCTION IN SMALL PONDS IN STUDY AREA



Source : Survey

which help in plankton production. In case of fingerling stocking of SPC and SPD groups, cost of manure increased with stocking density, which was Rs. 3293.75/ha/year and Rs. 3434.38/ha/year respectively, but the percentage of total cost was 13.08% and 11.91% respectively, decreased with stocking density.

The table points out the cost of hired labour and family labour both decreased with increase of stocking density. The cost of hired labour for SPA and SPB categories were Rs. 1130.00/ha/year and Rs. 1276.25/ha/year respectively. These constituted 6.07% and 5.30% of the total cost respectively. The cost of hired labour for SPC and SPD categories were Rs. 1354.38/ha/year and Rs. 1415.00/ha/year. These constituted 5.37% and 4.91% of the total cost respectively (Fig. 4.2).

The cost of family labour for SPA and SPB categories was Rs. 2780.00/ha/year and Rs. 2840.63/ha/ year respectively. These constituted 14.94% and 11.79% of the total cost respectively. The cost of family labour for SPC and SPD were Rs. 3103.13/ha/year and Rs. 3177.50/ha/year respectively.

These constituted 12.32% and 11.03% of total cost respectively.

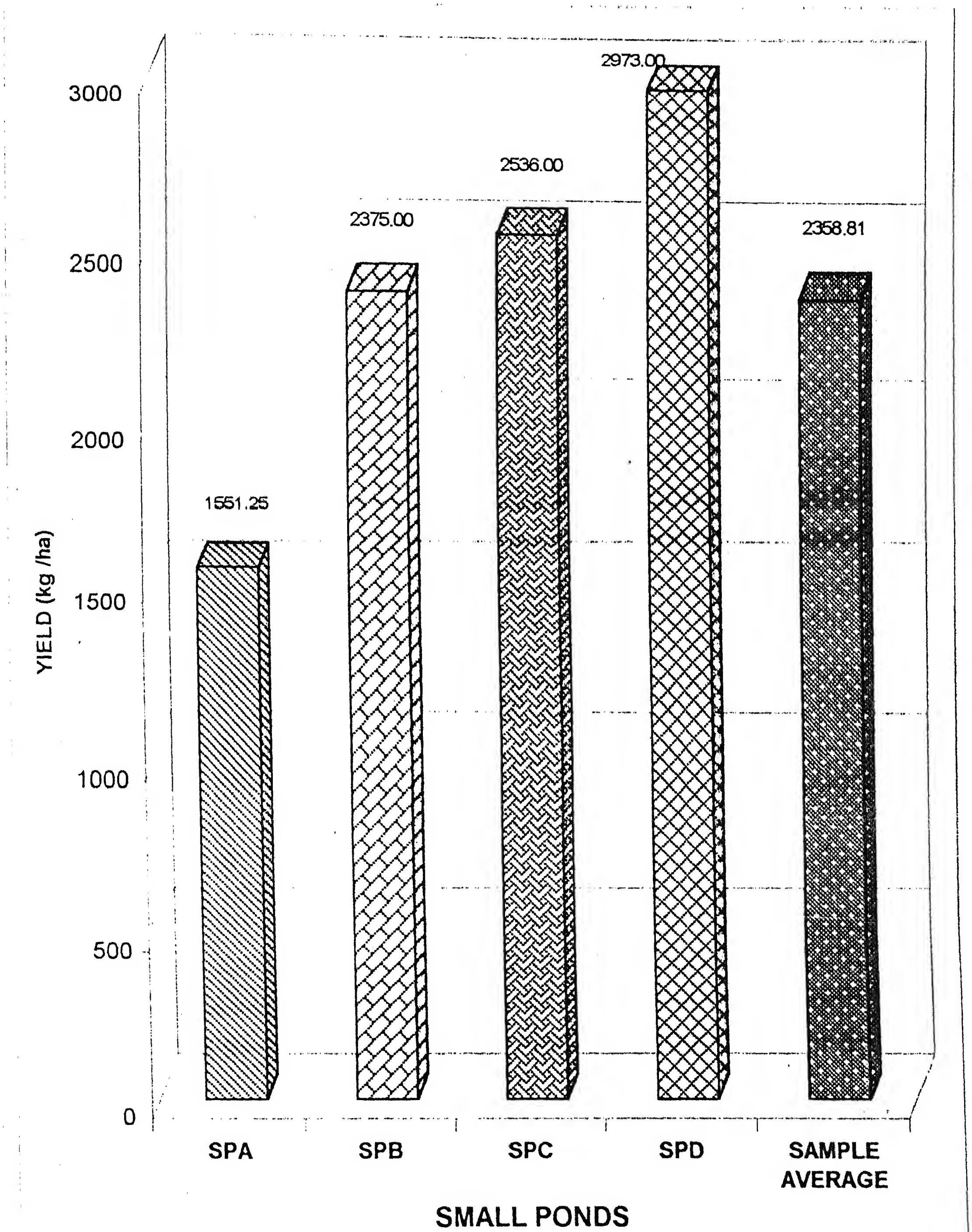
Sample average of small farms shows that the cost of feed is major share of the total cost, which was Rs. 4638.67/ha /year (19.19% of the total cost). It is followed by cost of seed, which was Rs. 3453.83 (14.29% of total cost) and manure Rs. 3171.25 (13.12% of total cost).

Present analysis reveals that variable cost accounts for more than 95% of the total cost while fixed cost constitute around 5% of the total cost because all the farmers use ponds taken on lease.

Table 4.52 Economics of fish cultured under different stocking densities and stocking sizes in small ponds in C.F.F. system of study area

Sl. No.	Details	SP-A	SP-B	SP-C	SP-D	Sample average
1.	Yield(kg/ha)	1551.25	2375.00	2536.00	2973.00	2358.81
2.	Total Return (Rs./ha)	38005.63	58187.50	62132.00	72838.50	57790.85
3.	Total cost of production(Rs./ha)	18603.31	24081.70	25180.40	28809.60	24172.60
4.	Net Return (Rs. / ha)	19397.32	34105.80	36951.60	44028.90	33618.23
5.	Family Labour Income (Rs. / ha)	22177.32	36946.43	40054.73	47206.40	36593.55
6.	Input-Output ratio	2.04	2.42	2.47	2.53	2.39
7.	Cost of production (Rs./kg)	11.99	10.14	9.93	9.69	10.25

FIGURE 4.3 AVERAGE YIELD OF FISH IN SMALL PONDS IN STUDY AREA (kg / ha)



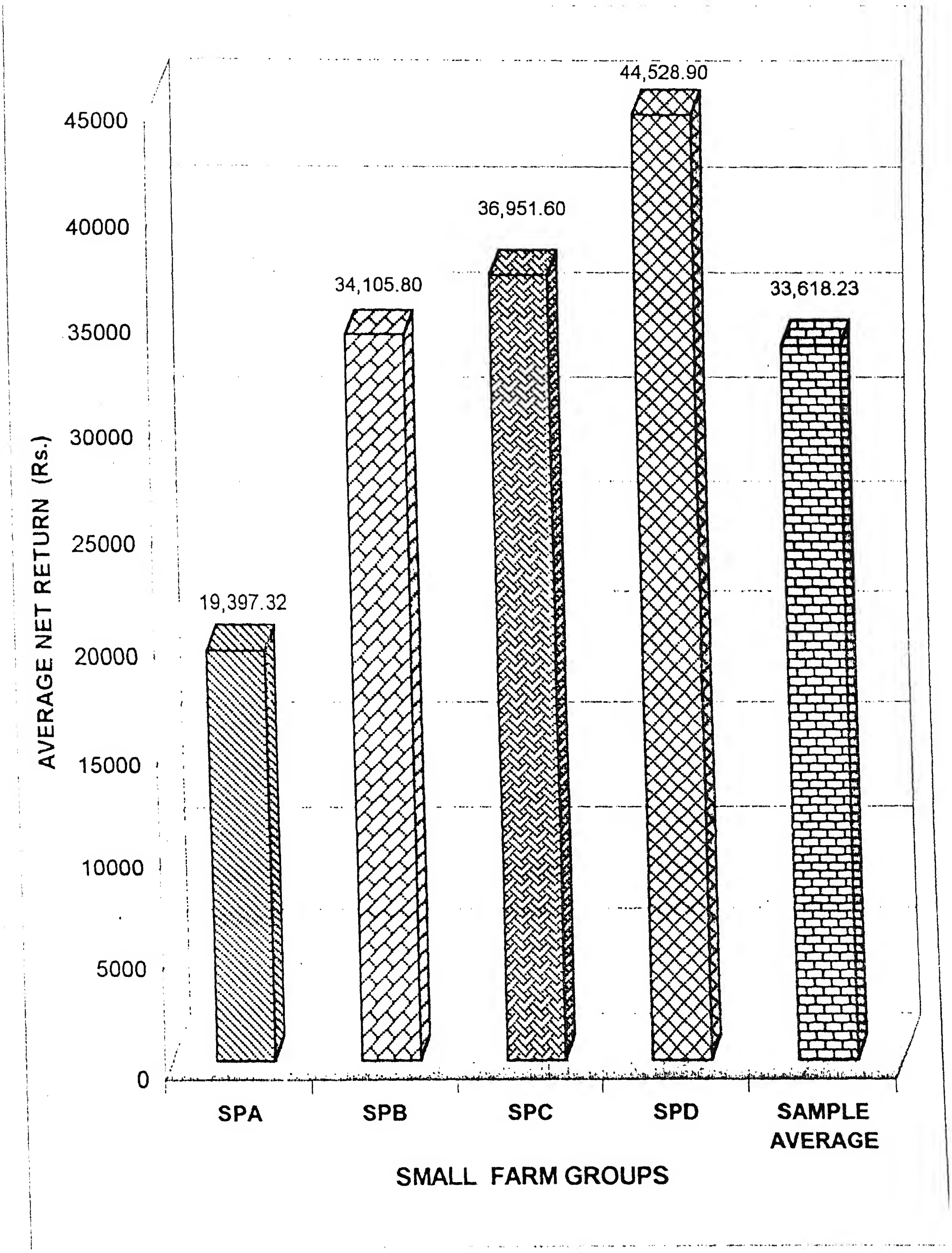
Source : Survey

4.4.2 Economics of community fish farming in small ponds:

The economics of carp culture with different size and stocking densities are presented in table 4.52. The average production of fish obtained from the SPA group was 1551.25 kg/ha, from SPB group 2375.00 kg/ha, from SPC group 2536.00 kg/ha and from SPD group 2973.00 kg/ha, showing that production increased with increase in stocking sizes and stocking densities (Fig. 4.3). The total returns obtained from SPA was Rs. 38,005.63/ha/year, Rs. 58,187.50 for SPB, Rs. 62,132.00/ha/year for SPC and Rs. 72,838.50/ha/year for SPD, with a net return of Rs. 19,397.32, Rs. 34,105.80, Rs. 36,951.60 and Rs. 44,028.90/ha/year respectively. This shows an increase in profitability with increase in stocking size as well as stocking density because fingerling stage mortality rate of seed is lower than the fry stage and stocking density increase the profitability. (Fig. 4.4)

It is observed that family labour income per year was Rs. 22,177.32, Rs. 36,946.43, Rs. 40,054.73, Rs. 47,206.40 and Rs. 36,593.54 for SPA, SPB, SPC, SPD and Sample average respectively. Highest family

FIGURE 4.4 AVERAGE NET RETURN (Rs.) FROM DIFFERENT STOCKING SIZES AND STOCKING DENSITIES GROUPS IN SMALL FISH FARMS OF C.F.F. SYSTEM



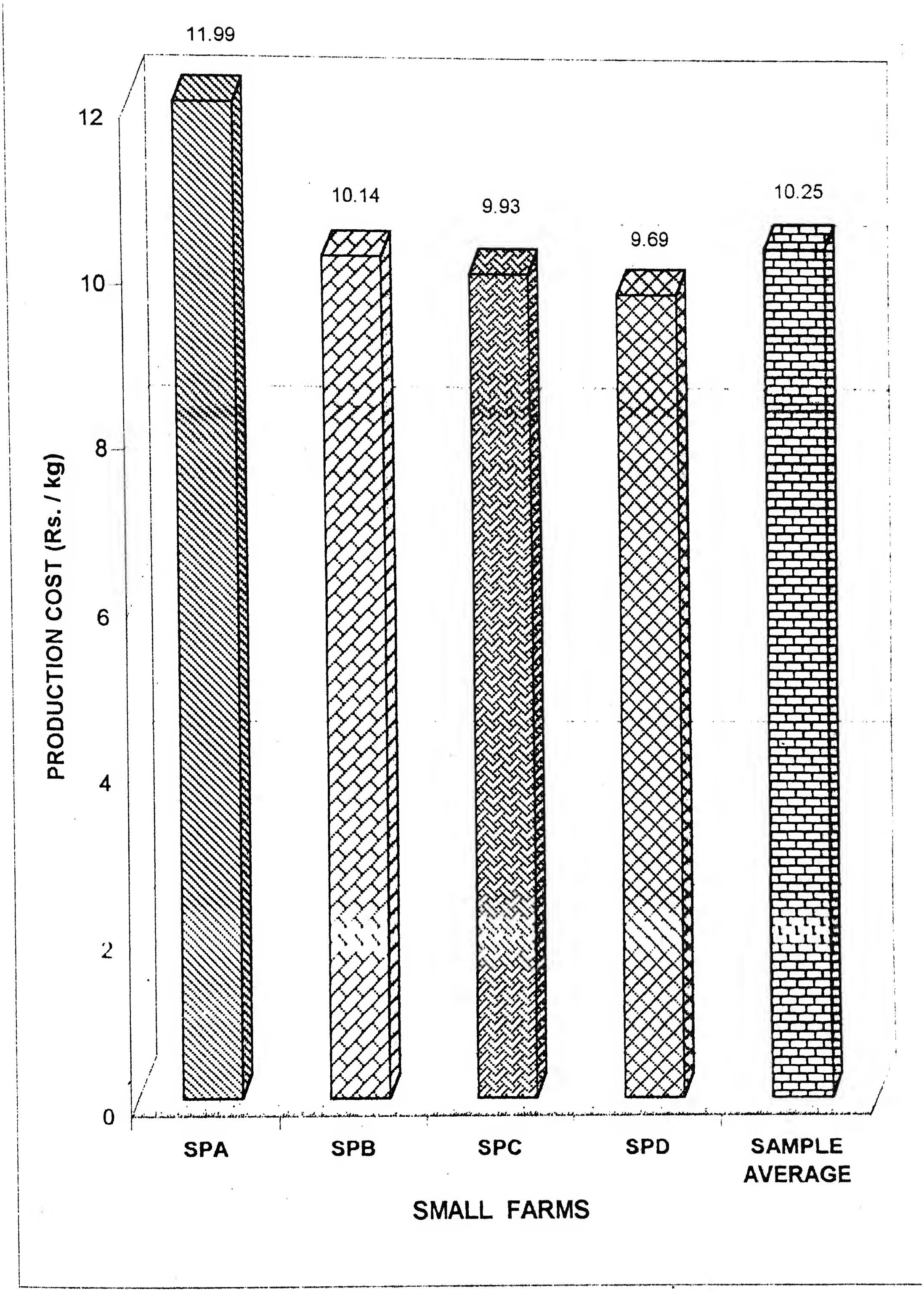
Source : Survey

labour income per year of Rs. 47,206.40 was obtained by SPD group fish farmers but the minimum was received by SPA group fish farmers.

The input-output ratio is estimated to be 2.04, 2.42, 2.47 and 2.53 for each of the four groups respectively. The average cost of production was Rs. 11.99, Rs. 10.14, Rs. 9.93 and Rs. 9.69 per kg of fish for first, second, third and fourth groups respectively (Fig. 4.5). These indicate that the cost of producing one kg of fish was cheaper with higher stocking density and big stocking material (fingerling) compared to lower stocking density and small stocking material (fry)(Fig. 4.6).

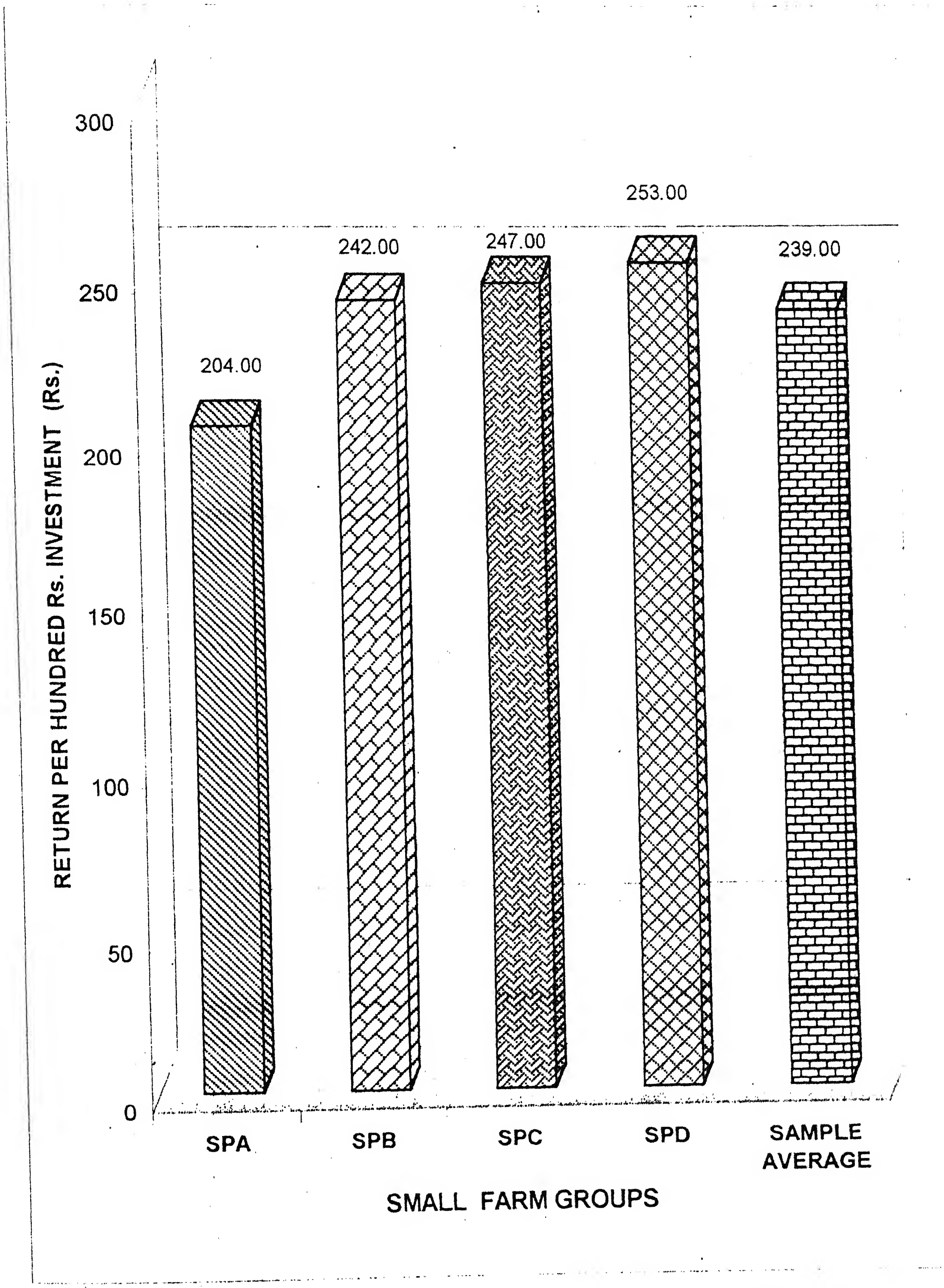
From the above, it may be concluded that stocking size and stocking density plays an important role in successfulness of fish farmers. In this case, group four SPD, where stocking size is bigger (fingerling) and stocking density is high, profitability is also high.

FIGURE 4.5 COST OF PRODUCTION PER kg OF FISH IN SMALL PONDS (Rs./kg)



Source : Survey

FIGURE 4.6 RETURN PER HUNDRED RUPEES INVESTMENT (Rs.) FROM SMALL PONDS OF DIFFERENT STOCKING SIZE AND STOCKING DENSITY



Source : Survey

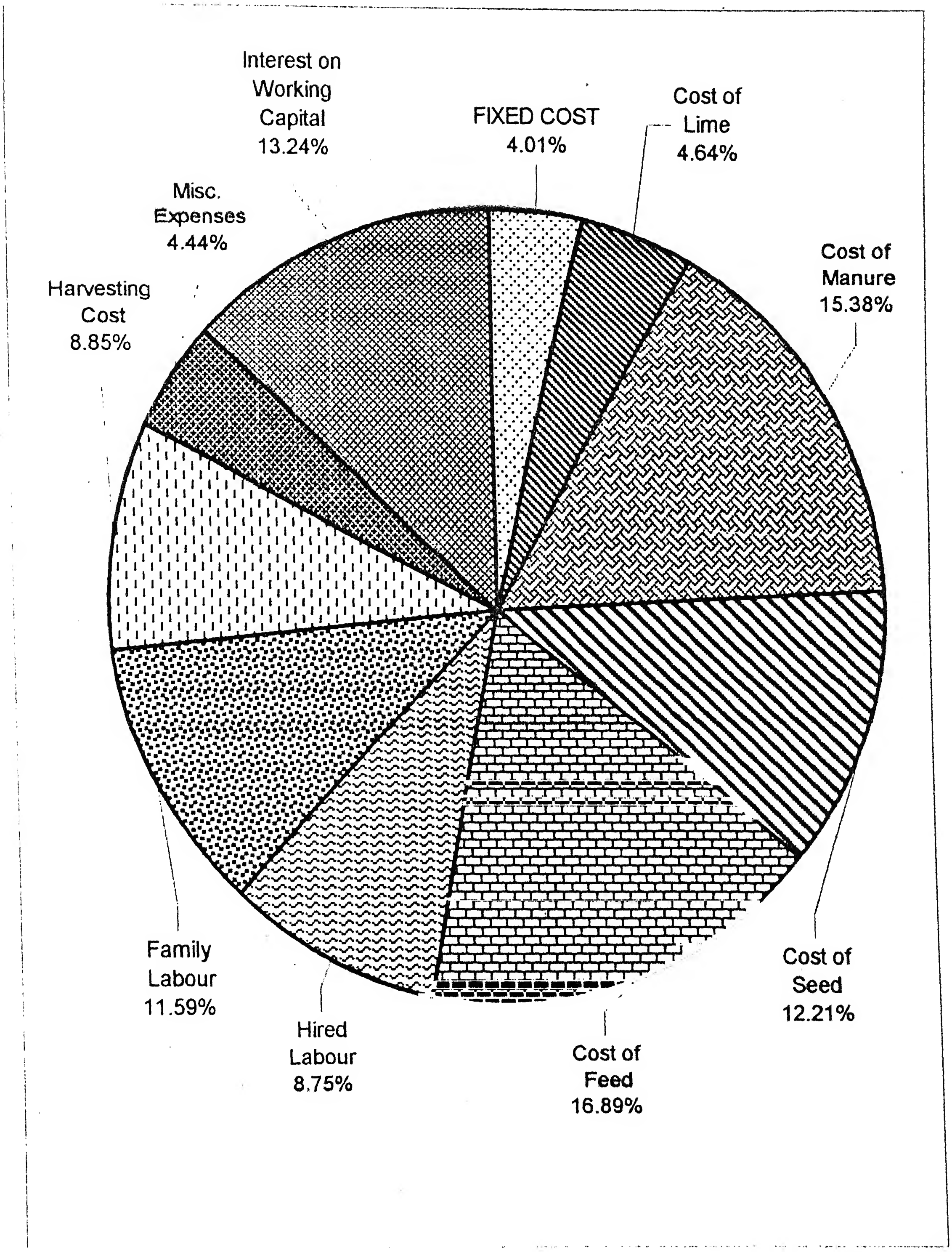
TABLE 4.53

Details of cost of production of fish under different stocking density and stocking size in C.F.F. System of study area (Large Ponds)

Sl. No.	Particulars	Rs. / ha / year in large ponds				
		LP - A	LP - B	LP - C	LP - D	Sample Average
		Fry stage	Fry stage	Fingerlings	Fingerlings	
		10,000 - 20,000	20,001and above	5,000 - 8,000	8,001 and above	
I.	**FIXED COST :**					
	i. Rent Amount	951.79	967.50	1026.07	974.93	976.50
		4.52%	*3.63%*	*3.74%*	*3.10%*	*3.66%*
	ii. Interest on fixed cost	85.66	87.08	92.35	87.74	87.89
		0.41%	*0.33%*	*0.34%*	*0.28%*	*0.33%*
A.	**Total Fixed Cost**	**1037.45**	**1054.58**	**1118.42**	**1062.67**	**1064.39**
		4.93%	*3.96%*	*4.07%*	*3.38%*	*3.99%*
II.	**VARIABLE COST :**					
	i. Cost of Lime	1228.93	1309.79	1152.29	1260.00	1237.75
		5.83%	*4.92%*	*4.19%*	*4.01%*	*4.64%*
	ii. Cost of Manure	3387.50	4127.50	4201.07	4676.79	4098.21
		16.08%	*15.30%*	*15.30%*	*14.87%*	*15.38%*
	iii. Cost of Seed	1877.86	2794.29	3541.07	4800.36	3253.39
		8.92%	*10.49%*	*12.90%*	*15.26%*	*12.21%*
	iv. Cost of Feed	3145.71	4683.50	4778.71	5388.71	4499.16
		14.93%	*17.59%*	*17.41%*	*17.14%*	*16.89%*
	v. Cost of Hired Labour	1902.07	2334.36	2386.07	2708.29	2332.69
		9.03%	*8.77%*	*8.69%*	*8.61%*	*8.75%*
	vi. Cost of Family Labour	2882.86	2960.71	3114.29	3394.29	3088.04
		13.67%	*11.12%*	*11.35%*	*10.79%*	*11.59%*
	vii. Cost of Harvesting	1890.07	2566.14	2384.43	2593.79	2358.61
		8.97%	*9.64%*	*8.69%*	*8.25%*	*8.85%*
	viii. Misc. Expenses	949.29	1272.93	1141.29	1372.14	1183.91
		4.51%	*4.78%*	*4.16%*	*4.36%*	*4.44%*
	ix. Interest on Working Capital @16%	2762.29	3527.88	3631.88	4191.17	3528.28
		13.11%	*13.25%*	*13.23%*	*13.32%*	*13.24%*
B.	**Total Variable Cost**	**20026.58**	**25577.10**	**26331.10**	**30385.54**	25580.04
		95.07%	*96.04%*	*95.93%*	*96.62%*	*96.01%*
C.	**TOTAL COST (A+B)**	**21064.03**	**26631.68**	**27449.52**	**31448.21**	26644.43
		100%	*100%*	*100%*	*100%*	*100%*

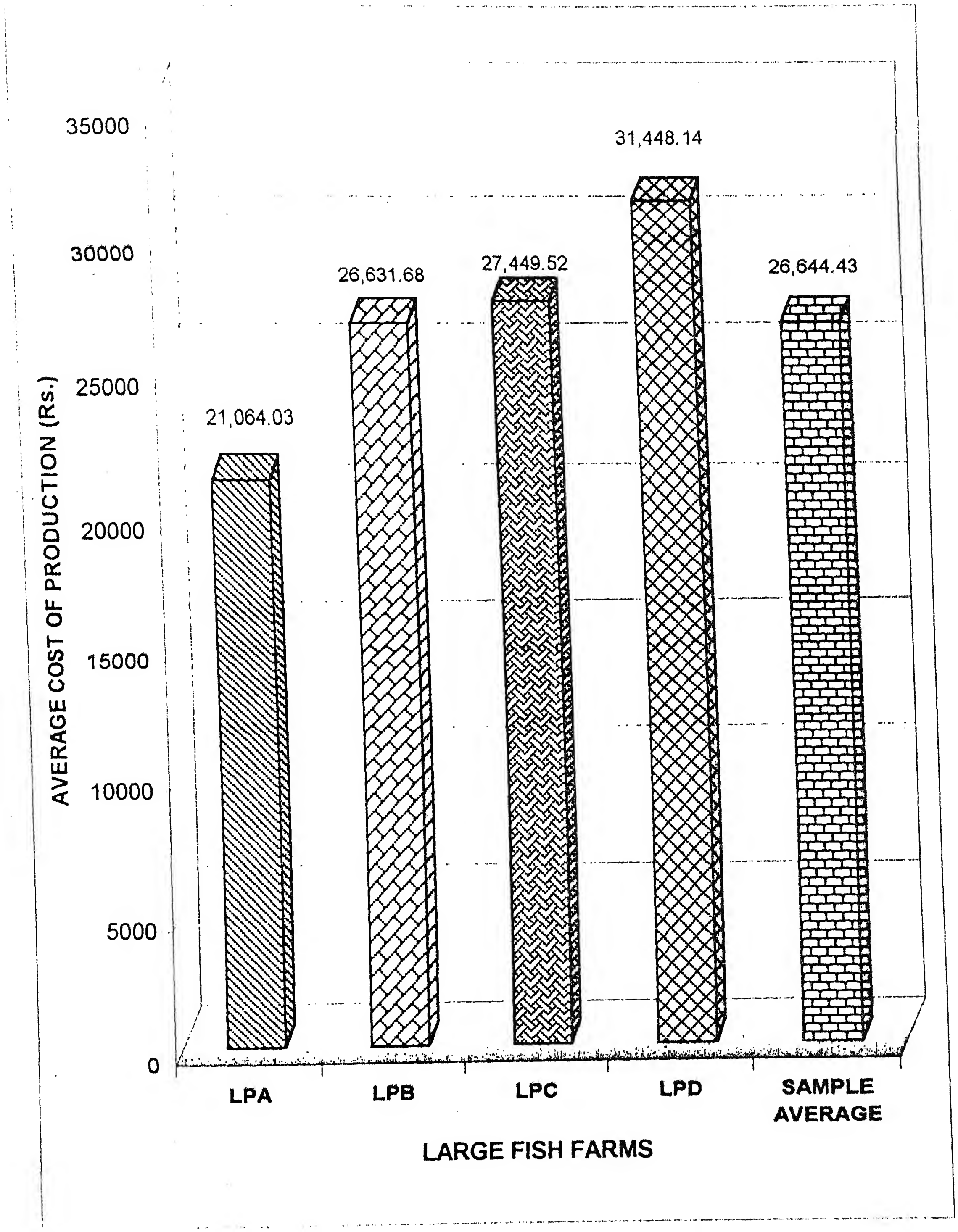
FIGURES SHOWN IN ITALICS, SHOWS THE PERCENTAGE OF TOTAL COST OF PRODUCTION

Figure 4.7 COMPONENT WISE COST OF PRODUCTION IN LARGE PONDS IN STUDY AREA



Source : Survey

FIGURE 4.8 AVERAGE COST OF PRODUCTION (Rs.) IN DIFFERENT STOCKING SIZE AND STOCKING DENSITY GROUPS IN LARGE FISH FARMS IN C.F.F. SYSTEM



Source : Survey

4.4.3 Cost of production of fish under different stocking density and stocking size in community fish farming in large ponds:

The costs of fish culture at the different stocking densities and stocking sizes in large fish farms are given in table 4.53

The total fixed cost for the culture of carps in large ponds for the LPA, LPB, LPC and LPD categories were Rs. 1037.45, Rs. 1054.58, Rs. 1118.42 and Rs. 1062.67/ha/year, respectively. These constituted 4.93%, 3.96%, 4.07% and 3.38% of the total cost respectively. The sample average was Rs. 1068.28/ha/year (fig. 4.7).

The total variable cost worked out to Rs. 20,026.58, Rs. 25,577.10, Rs. 26,331.10 and Rs. 30,385.54/ha/year for four groups respectively, which constituted 95.07%, 96.04%, 95.93% and 96.62% of their total cost. Out of this 14.93% and 17.59% were used for feed for the first and second group. Hence, it is evident that in same stocking size (fry stage) as the stocking density increased, the feeding cost increased. It is also found that the cost of seed also increased from 8.92% in case of LPA to 10.49% in case of LPB (Fig. 4.8).

In case of 3rd and 4th group, 17.41% and 17.14% were used for feed. It is evident that in same stocking size (fingerling) as the stocking density increased, the cost of feed Rs. 4778.71/ha/year and Rs. 5388.71/ha/year respectively were increased, but the percentage of feeding cost slightly decreased in the fourth group LPD. This is because fish farmers harvest fish in between the final fish harvest which help in decreasing the feeding cost in fourth group.

In case of 3rd and 4th groups, seed cost also increased, which were Rs. 3541.07 and Rs. 4800.36/ha/year respectively.

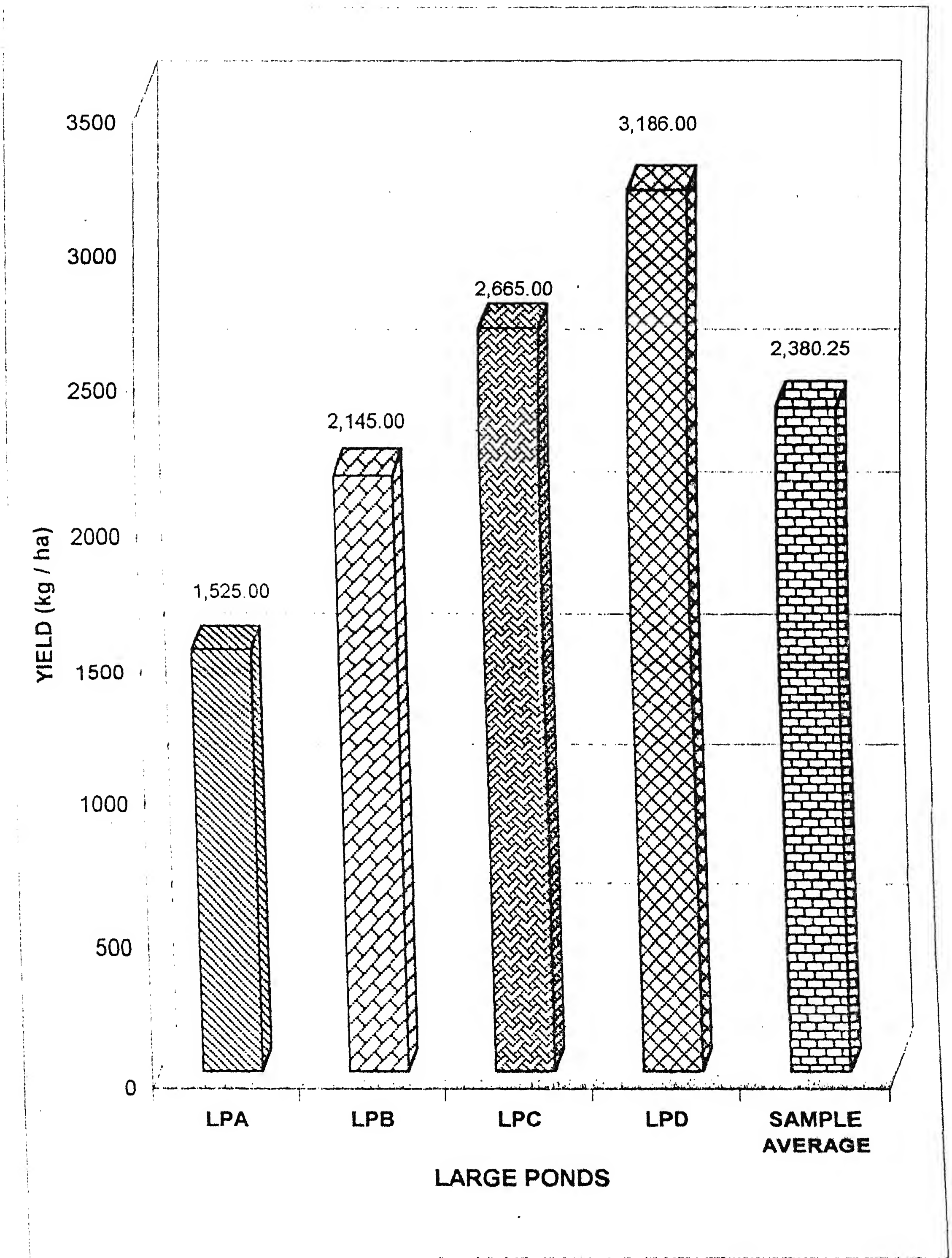
From the table 4.53, it is found that the cost of manure; Rs. 3387.50, Rs. 4127.50, Rs. 4201.07 and Rs.4676.79/ha/year respectively and constitute 16.08, 15.49%, 15.30% and 14.87% of the total cost respectively. In both the stocking size, increasing of stocking density, decrease in the percentage of total cost for manures is found, which indicates that farmers pay more for supplementary feed than manure which help in plankton production, when stocking density is increased.

The table points out the cost of hired labour and family labour both decreased with increase of stocking density. The cost of hired labour for LPA and LPB categories were Rs. 1902.07 and Rs. 2334.36/ ha/year respectively. These constituted 9.03% and 8.77% of the total cost respectively. The cost of hired labour for LPC and LPD categories were Rs. 2386.07 and Rs. 2708.29/ha/year. These constituted 8.69% and 8.61% of the total cost respectively.

The cost of family labour for LPA and LPB categories were Rs. 2882.86 and Rs. 2960.71/ha/year respectively. These constituted 13.67% and 11.12% of the total cost respectively. The cost of family labour for LPC and LPD were Rs. 3114.29 and Rs. 3394.29/ha/ year respectively. These constituted 11.35% and 10.79% of total cost respectively.

Sample average of large farms shows that the cost of feed is major share of the total cost, which was Rs. 4499.16/ha/year (16.89% of the total cost). It is followed by cost of manure, which was Rs. 4098.21 (15.38% of total cost) and seed Rs. 3253.39 (12.21% of total cost).

FIGURE 4.9 AVERAGE YIELD OF FISH IN LARGE PONDS IN STUDY AREA (Kg / ha)



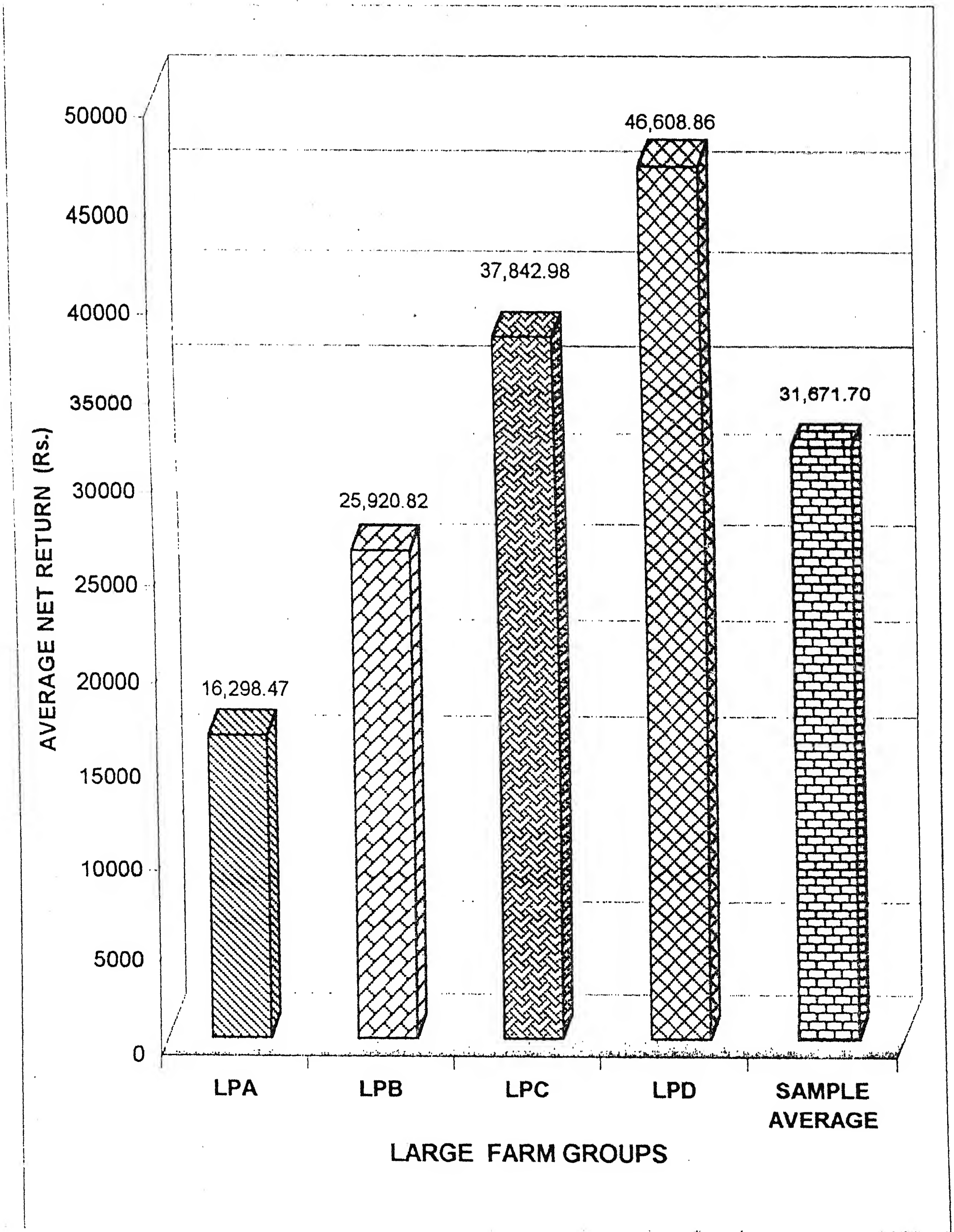
Source : Survey

Present analysis reveals that variable cost accounts for more than 95% of the total cost while fixed cost constitute merely around 5% of the total cost because all the farmers use ponds taken on lease.

Table 4.54 Economics of fish cultured under different stocking densities and stocking sizes in large ponds in C.F.F. system of study area

Sl. No.	Details	LP-A	LP-B	LP-C	LP-D	Sample average
1.	Yield (kg/ha)	1525.00	2145.00	2665.00	3186.00	2380.25
2.	Total Return (Rs./ha)	37362.50	52552.50	65292.50	78057.00	58316.13
3.	Total cost of production (Rs./ha)	21064.03	26631.68	27449.52	31448.14	26644.43
4.	Net Return (Rs. / ha)	16298.47	25920.82	37842.98	46608.86	31671.70
5.	Family Labour Income (Rs. / ha)	19181.33	28881.53	40957.27	50003.15	34759.74
6.	Input-Output ratio	1.77	1.97	2.38	2.48	2.19
7.	Cost of production (Rs./kg)	13.81	12.42	10.93	9.87	11.19

FIGURE 4.10 AVERAGE NET RETURN (Rs.) FROM DIFFERENT STOCKING SIZES AND STOCKING DENSITIES GROUPS IN LARGE FISH FARMS OF C.F.F. SYSTEM



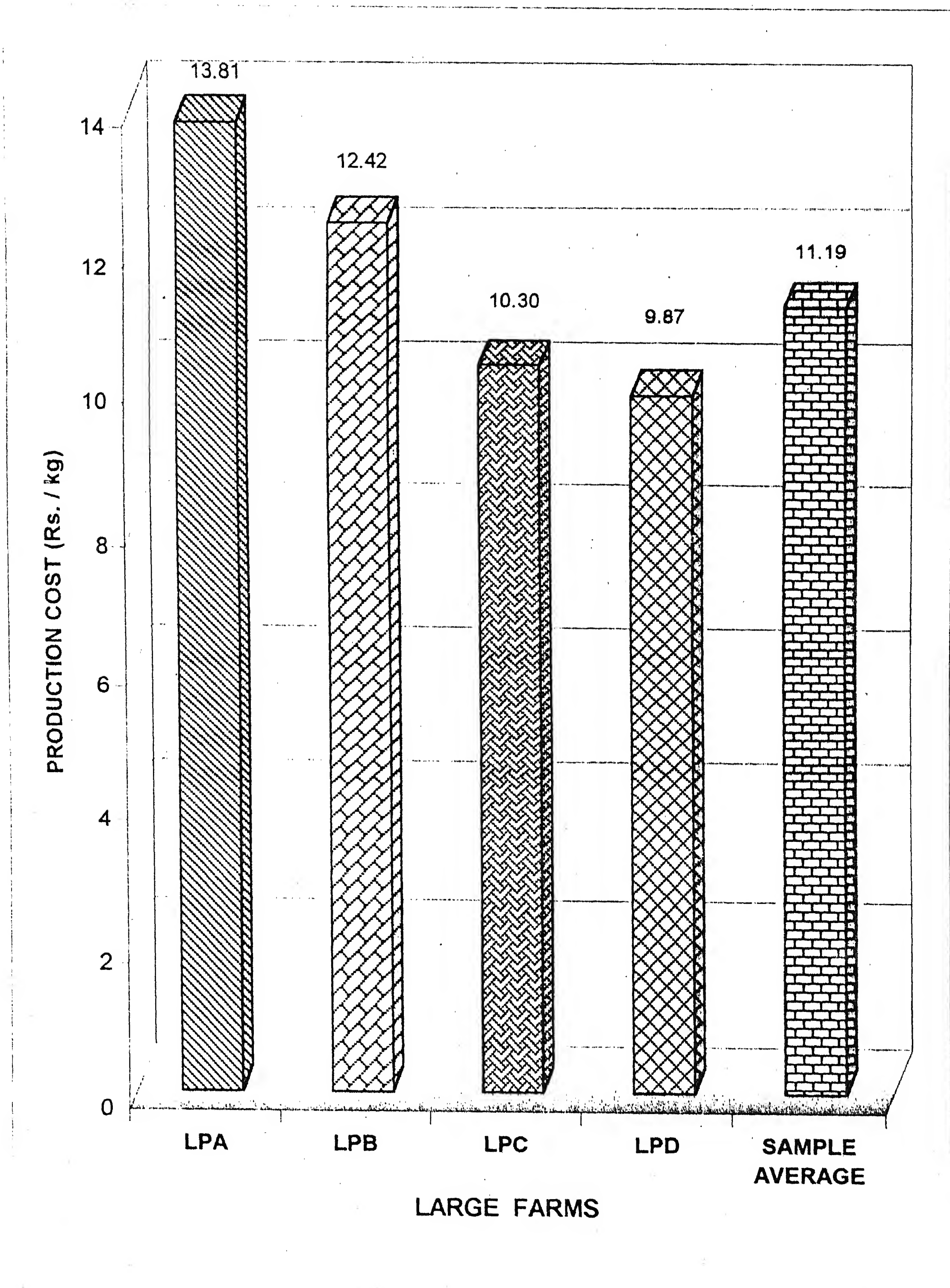
Source : Survey

4.4.4 Economics of community fish farming in large ponds:

The economics of carp culture with different size and stocking densities are presented in table 4.54. The average production of fish obtained from the LPA group was 1525.00 kg/ha, from LPB group 2145.00 kg/ha, from LPC group 2665.00 kg/ha and from LPD group 3186.00 kg/ha, showing that production increased with increase in stocking sizes and stocking densities (Fig. 4.9). The total returns obtained from LPA was Rs. 37,362.50/ha/year, Rs. 52,552.50.50 for LPB, Rs. 65,292.50/ha/year for LPC and Rs. 78,057.00/ha/year for LPD, with a net return of Rs. 16,298.47, Rs. 25,920.82, Rs. 37,8742.98 and Rs. 46,608.86/ha/year respectively. This shows an increase in profitability with increase in stocking size as well as stocking density because in fingerling stage mortality rate of seed is lower than the fry stage and stocking density increase the profitability (Fig. 4.10).

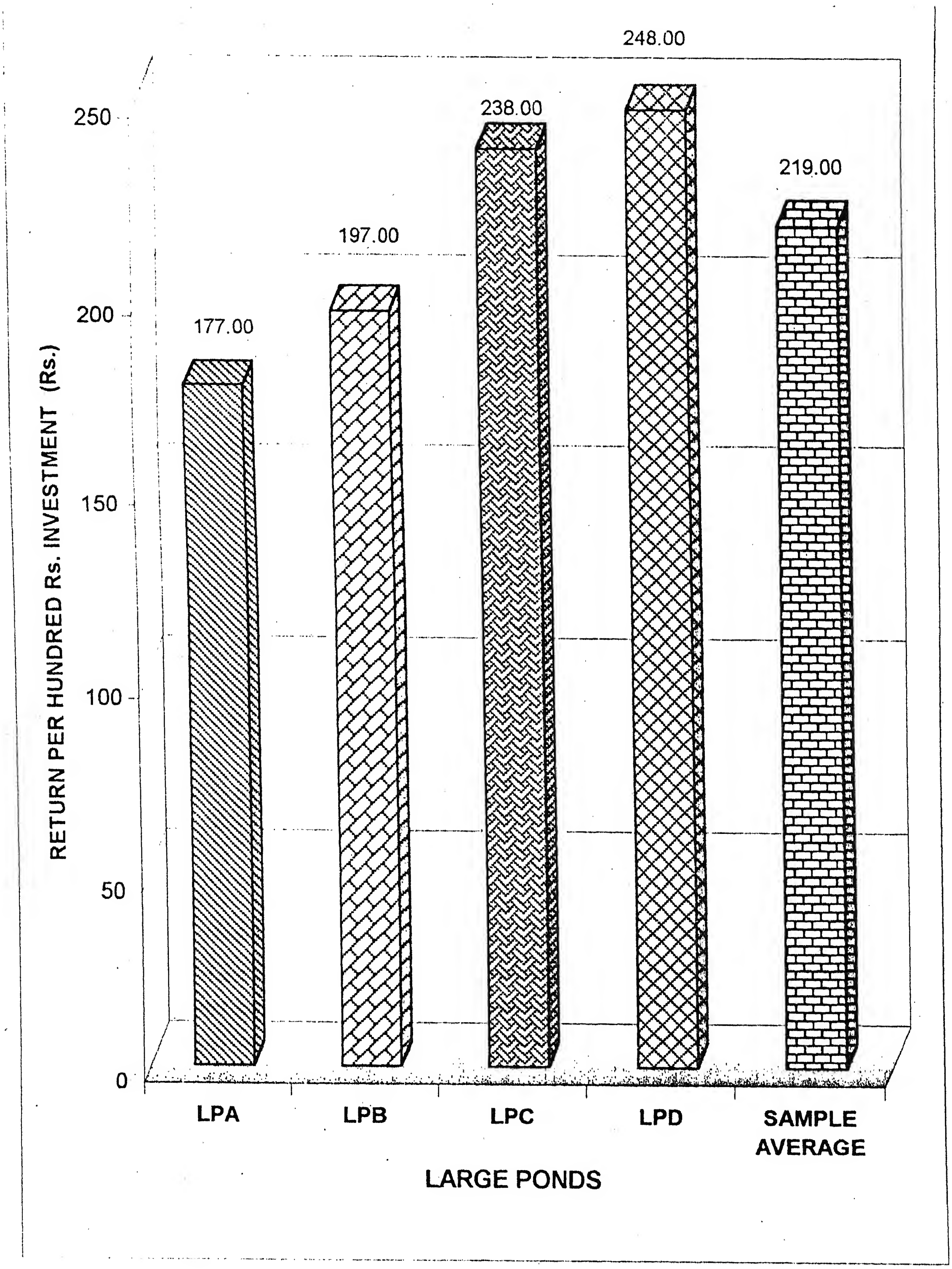
It is observed that family labour income per year was Rs. 19,181.33, Rs. 28,881.53, Rs. 40,952.27, Rs. 50,003.15 and Rs. 34,759.74 for LPA, LPB, LPC, LPD and Sample average respectively. The highest

FIGURE 4.11 COST OF PRODUCTION PER kg OF FISH IN LARGE PONDS (Rs./kg) IN STUDY AREA



Source : Survey

FIGURE 4.12 RETURN PER HUNDRED RUPEES INVESTMENT (Rs.) FROM LARGE PONDS OF DIFFERENT STOCKING SIZE AND STOCKING DENSITY



Source : Survey

family labour income per year of Rs. 50,003.15 was obtained by LPD group fish farmers but the minimum was received by LPA group fish farmers.

The input-output ratio is estimated to be 1.77, 1.97, 2.38 and 2.48 for each of the four groups respectively. The average cost of production was Rs. 13.81, Rs. 12.42, Rs. 10.30 and Rs. 9.87 per kg of fish for 1^{st}, 2^{nd}, 3^{rd} and 4^{th} groups respectively (Fig. 4.11). These indicate that the cost of producing one kg of fish was cheaper with higher stocking density and big stocking material (fingerling) compared to lower stocking density and small stocking material (fry).

From the above, it may be concluded that stocking size and stocking density plays an important role in successfulness of fish farmers. In case of large pond, stocking size plays more important role. Big stocking material (fingerling) fetch more money (Fig. 4.12).

4.5 PROBLEM IN C.F.F. SYSTEM WITH SUGGESTED MEASURES:

4.5.1 Problem as perceived by fish farmers in C.F.F. system:

Jamunapar region of Allahabad district endowed with natural resources and human skills for taking up intensive fish culture, but the gap between the actual and potential yield continues to persist. The new technology, which seems technically feasible, has failed to produce substantial results in the field condition. Problems in community fish farming system as perceived by the farmers are given below in Table 4.55:

Table 4.55 Problem in C.F.F. system as perceived by the fish farmers

Sl. No.		Total Score	Percentage of total score	Rank Order
1.	Non availability of credit	224	31.1	I
2.	Lack of knowledge about technology	116	16.1	II
3.	Erratic supply of quality fish seed	110	15.3	III
4.	High cost of input	63	8.8	IV
5.	Low and fluctuating price at farm gate	54	7.5	V
6.	Poaching in ponds	36	5.0	VI
7.	Lack of suitable organised market	32	4.4	VII
8.	Non retention of water throughout the year	30	4.2	VIII
9.	Fish disease	29	4.0	IX
10.	Poisoning of pond	26	3.6	X
	TOTAL	**720**	**100**	

Table 4.55 charts out the major problems in C.F.F. System as perceived by the fish farmers. "Non availability of credit" has been perceived by the fish farmers as the most important problem (31.1% of the total weightage) in C.F.F. System. The second most important problem as perceived by the fish farmers was "lack of knowledge" (16.1%) in adopting the carp culture technology. "Erratic supply of quality fish seed" (15.3%)(especially exotic carps, viz. Silver carp, Grass carp and common carp) at reasonable price and specific time poses a serious constraint in rural areas. Most of the farmers used fish seeds with the mixture of Catla, Rohu and Mrigal and small sized seeds (fry stage / early fry stage) collected from various hatcheries, are being directly stocked in ponds resulting in poor survival. This has been perceived as the third important problem (15.3%) perceived by the farmers.

Table 4.55 shows that "high cost of inputs" (8.8%) and "low and fluctuating price of fish at farm gate" (7.5%) has been perceived as fourth and fifth problems in C.F.F. System.

"Poaching" (5.0%) was also considered a major inhibiting factor ranked sixth in position. "Lack of suitable organised market" (4.4%), 'Non retention of water throughout the year" (4.2%), "Fish diseases" (4.0%) and "poisoning of ponds" (3.6%) have been perceived as common problem in C.F.F. System.

4.5.2 Analysis of problems with root cause in C.F.F. system:

Table 4.56 reflects the analysis of problem with root cause. The problems are grouped into five sub-sections, viz.:

i. Basic input / resources;

ii. Financial constraints;

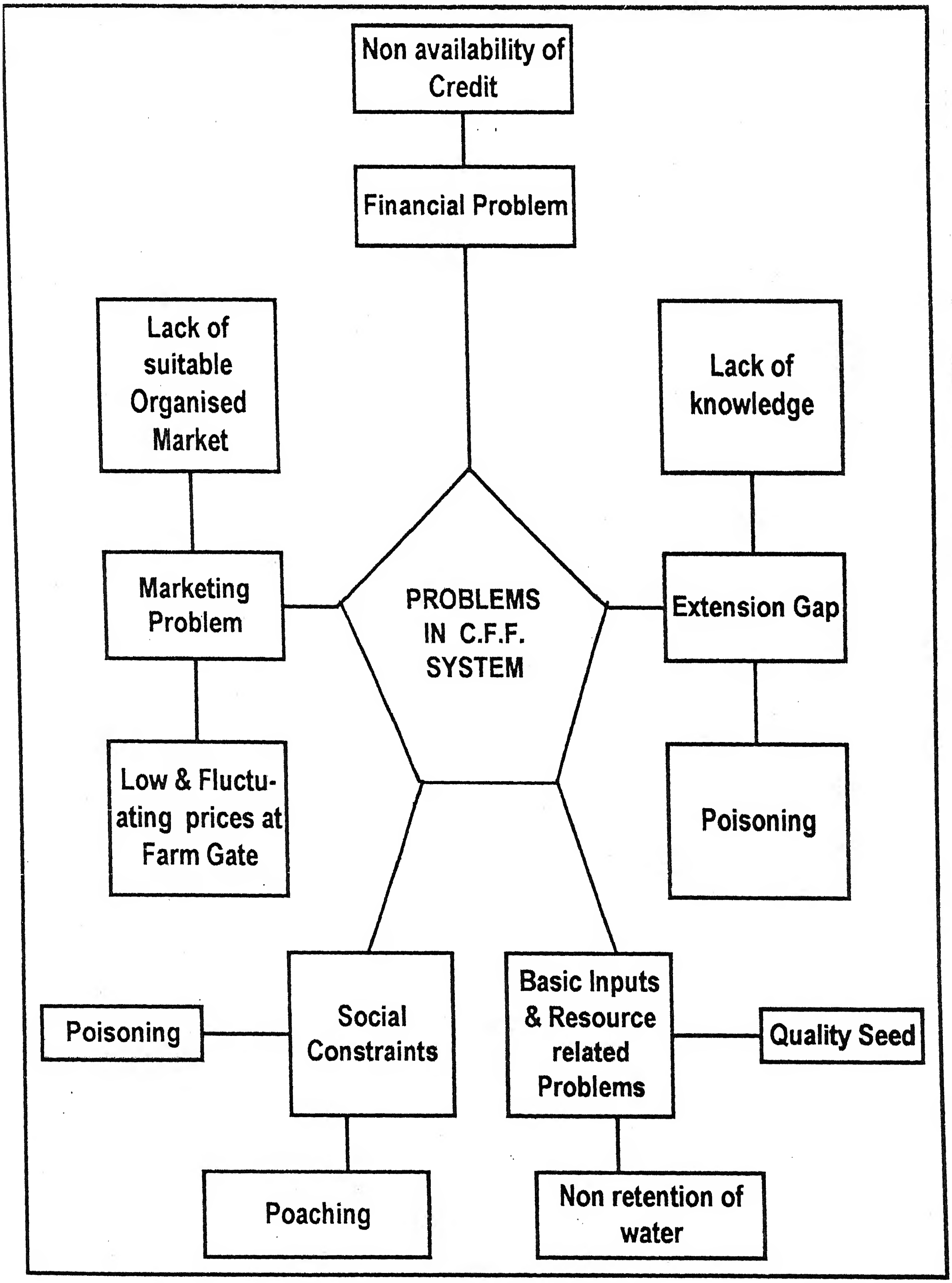
iii. Marketing constraints;

iv. Extension gap; and

v. Social constraints.

Table 4.56 points out the financial constraints (39.9%) as major problem in community fish farming system. Main root causes are clarified in column 3. The Banks require project prepared by the farmers, who are by and large uneducated and ill informed. Further, the fish farmers are often landless daily wage labourers who have nothing to offer as security for loan from Bank.

Figure 4.13 Problem Tree Analysis

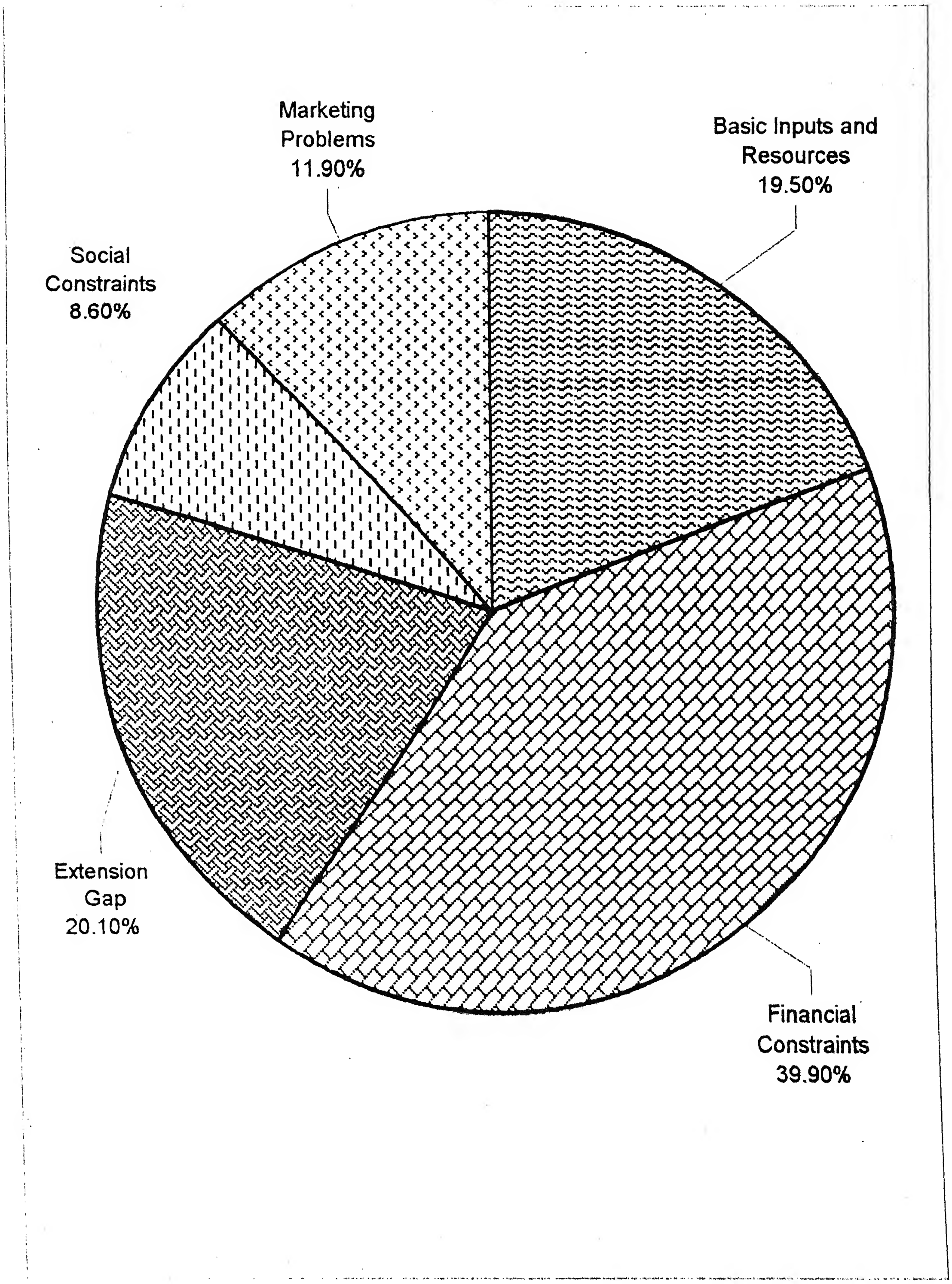


Extension gap (20.1%) ranked 2nd in position. Extension of scientific methods to rural areas still remains largely inadequate. The farmer is either inadequately trained without practical based training programme or not trained at all. Multi-ownership and unwillingness hampers the acceptance of modern technology. Fish farmers are unaware about fish diseases.

The third most important constraint is availability of basic input/resources (19.5%) and root causes are discussed in column 3. Lack of exotic carp seed hatcheries has compelled the farmers in rural areas to resort to culture employing indigenous carps only (Fig. 4.13).

Large ponds invariably have predatory fish population, the control of which is not feasible through de-watering or using fish toxicant since these ponds are mainly meant for multi-purpose use. Yet they are stocked with fry, the chance of survival of which is very meagre and consequently they do not yield much. Most of the fish farmers used seed with the mixture of Catla, Rohu and Mrigal because hatcheries supply the mixture seed.

Figure 4.14 **PROBLEMS FACED BY FISH FARMERS**



Water level decline in ponds during summer months and most of the farmers use pond water for irrigation of different crops.

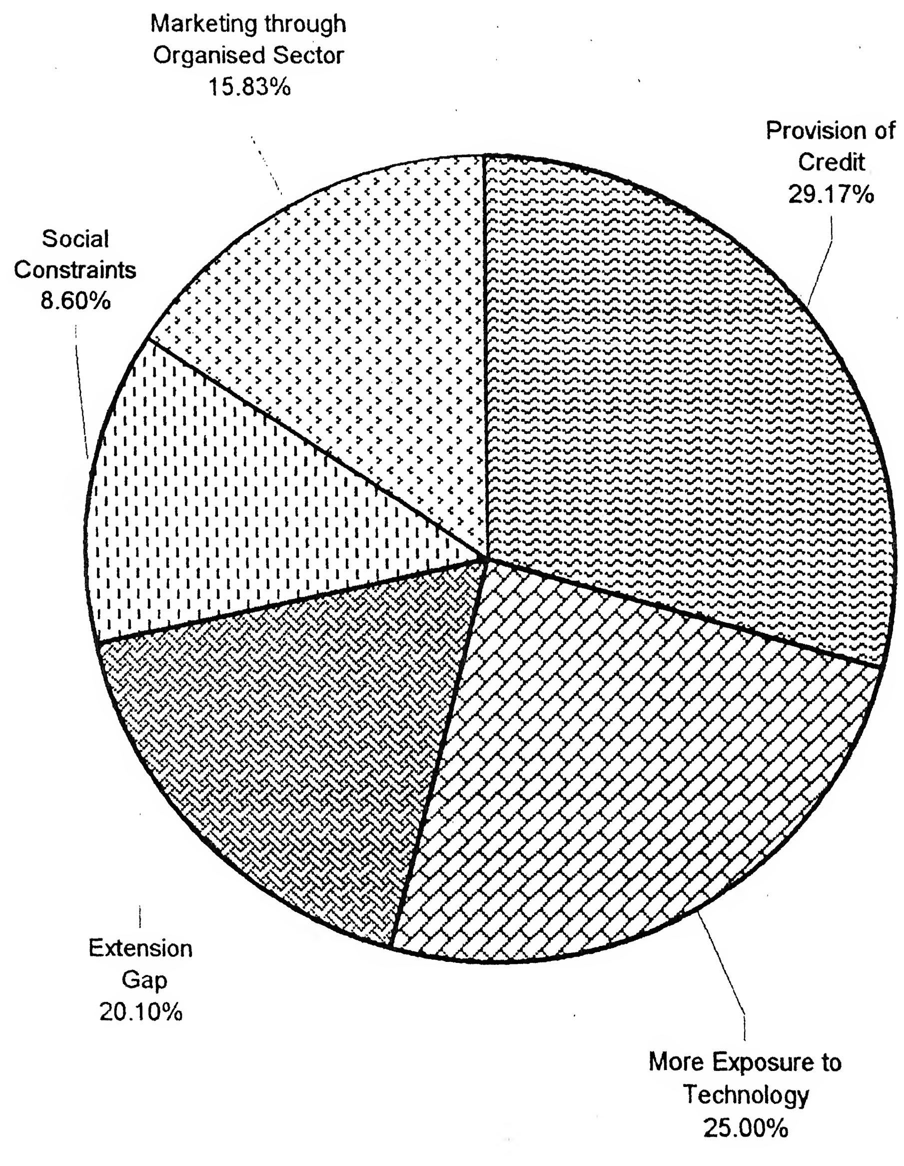
The main marketing problems (11.9%) mentioned by the farmers were lack of infrastructural facilities like cold storage, good approach roads from landing sites to marketing centres and quick transport. The fish markets are controlled by powerful groups of middlemen who buy from the producers at low price at farm gate (Fig. 4.14).

In social constraints (8.6%) poaching and poisoning by organised dacoties have become a serious problem. Lack of proper monitoring is main cause of poaching. Economic competition among farmers is the root cause of poisoning of ponds.

Table 4.56 **Analysis of problem with root cause in C.F.F. system**

Sl. No.	Type of problem		Root cause		Score / (%)	Rank Order
1	2		3		4	5
1.	**Financial constraints:**					
	a.	Non availability of credit	a.	Fish farmers are unable to prepare project which is required by Banks	287 (39.9)	I
	b.	High cost of inputs	b.	Have nothing to offer as security of loan from Banks		
			c.	Paucity of local distribution of inputs		
2.	**Extension Gap:**					
	a.	Lack of knowledge about technology	a.	Lack of practical base training programme	145 (20.1)	II
	b.	Fish disease	b.	Lack of suitable demonstration unit		
			c.	Multi-ownership and unwillingness hampers the acceptance of modern technology		
			d.	Unawareness about fish diseases		
			e.	Lack of proper up-keep of ponds		
3.	**Constraints in availability of basic input/resource**					
	a.	Erratic supply of quality fish seeds	a.	Lack of exotic carp seed hatchery and low number of carp seed hatchery	140 (19.5)	III
	b.	Non retention of water	b.	Soil conditions, heavy evaporation		
			c.	Lack of refilling sources		
			d.	Pond water used for irrigation of different crops during summer months		
4.	**Marketing problem:**					
	a.	Lack of suitable and organised market	a.	Fish markets are controlled by middlemen	86 (11.9)	IV
	b.	Low and fluctuating price at farm gate				
5.	**Social constraints:**					
	a.	Poaching in ponds	a.	Great demand of fish	62 (8.6)	V
	b.	Poisoning of Ponds	b.	Proper monitoring		
			c.	Economic competition		

Figure 4.15 MEASURES SUGGESTED BY THE FARMERS



4.5.3 Measures suggested by the fish farmers in increasing the yield of fish:

Table 4.57 indicates the suggested measures. The fish farmers suggested "Provision of Credit" (29.17%) to purchase the necessary inputs as the prime requisite in the process of adoption of high yielding technology. The Banks or other Financial Institutions need to float liberal credit policies to support fish farmers in a big way.

Table 4.57 Measures suggested by the fish farmers

Sl. No.	Suggested measures	Frequency	Frequency Percentage	Rank
1.	Provision of credit for fish culture	105	29.17	I
2.	More exposure to technology	90	25.00	II
3.	Supply of good quality of carp seed	68	17.50	III
4.	Marketing through organised sector	57	15.83	IV
5.	Control of poaching and poisoning	45	12.50	V
	TOTAL	360	100.00	

More exposure to technology (25.00%) ranked second suggested measure. Knowledge regarding maintenance of ponds' hygiene and fish health care

merits a special attention in making aquaculture a profitable venture (Fig. 4.15).

To gear up the fisheries extension services that we require not only strengthening by way of additional suitably trained manpower, but also regular provision of additional publicity material. This also points out the gross inadequacy of present day extension services in fish farming, especially in rural areas.

Provision of adequate "quality carp seed" (17.50%) for fish culture forms the third important priority measure suggested by them. The finding underlines the need for producing more seed of exotic carps to fill the gap. Perhaps good quality carp seeds could be attained by training the farmers to rearing fry in their own nursery ponds.

Among the measures suggested by the fish farmers, "Marketing through organised sector" (15.89%) ranked fourth. Organised arrangements for storage and marketing of fish are necessary and would be helpful in stabilising price structure to benefit both - the producers and consumers. Efficient Co-operative marketing organisations may minimise and

ultimately do away the vicious circle of the middlemen. The fish farmers may take up the operation without any uncertainty associated with prices.

The fish farmers considered the control of poaching and poisoning of ponds as the fifth important measure favouring culture of fish. Social awareness and educating the villagers, especially the youth force, might reduce the intensity of the problem. Formation of resistance groups consisting of members of Panchayats, fishermen co-operative societies and fishes farmer clubs to keep constant vigil of the water area. It may be helpful if bushy plant material is put inside ponds to prevent easy netting. Hooks attached to the bottom of boat, rowed in water, might locate gill nets, hook and lines if any put by poachers. Training watchdogs may prove more effective and economical in controlling poaching.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATION

This chapter deals with the review of problems, objectives, hypothesis, the research methodology and summary of major findings and conclusions based upon them. In addition, recommendations have also been made to economically viable and problem free.

The purpose of the present study was to analyse the economics of community fish farming of selected villages in Chaka, Jasra and Meja blocks of Jamunapar region of Allahabad district.

Efforts were also made to identify the problems in community fish farming system.

PROBLEM:

There is need to evaluate the economics of community fish farming system in Jamunapar region of Allahabad district and identify the major problem in C.F.F. system, so that suitable measures for its greater adoption may be suggested.

OBJECTIVES OF THE STUDY:

Based on the above problem, the following objectives were set up for the study:

1. To examine the present status of community fish farming (C.F.F.) practices, that exist in Jamunapar region of Allahabad district in U.P.;
2. To study the farmers' attitude towards community fish farming in the study area;
3. To estimate the development of fallow, unproductive and marginally productive lands for generating employment in rural areas;
4. To estimate the economic benefits to be derived from the C.F.F. system on different size of fish ponds in the study area;
5. To estimate the input-output ratio of different size of fish ponds in the study area; and
6. To identify the major problems faced by fish farmers and their suggestive measures.

HYPOTHESIS:

(a) Traditional fish farming practices are existing in the study area.

(b) Successes of fish farming are the source of encouragement to the local people to expand them as an additional source of income.

RESEARCH METHODOLOGY:

Chaka, Jasra and Meja blocks of Jamuna par region of Allahabad district were selected purposively for the present study. Sufficient number of community fishponds (both small and large) existed in these blocks.

A set of 64 small fish farmers (having below 1 ha pond) and 56 large farmers (having above 1 ha pond) were purposively selected as respondents from the forty-six villages of Chaka, Jasra and Meja blocks.

Collection, tabulation and analysis of data:

The data were collected from respondents through personal interviews schedule by the researcher himself. Data thus collected, were tabulated, analysed and interpreted in the light of the six objectives set up for the study.

Statistics used for analysis:

Two types of statistical analysis were used, namely descriptive and inferential statistics. Descriptive statistics included range, percentage and mean. Inferential statistics included 't' test, 'Z' test, Pearson Product Moment Correlation Coefficient

(r) and X^2 test. These were used to test the reliability and validity of scale and to test the significance of difference.

FINDINGS OF THE STUDY:

Findings of the study relating to present status of community fish farming practices, attitude of fish farmers, development of fallow, unproductive and marginally productive land for rural employment, economics of community fish farming, input-output relation. Major problems faced by fish farmers and their suggestive measures are summarised as follows:

PRESENT STATUS OF COMMUNITY FISH FARMING PRACTICES IN JAMUNAPAR REGION OF ALLAHABAD DISTRICT:

A. Physical status of c.f.f. System of study area:

Total number of small ponds (below 1 ha) and large ponds (above 1 ha) surveyed were 64 and 56 respectively.

Among small ponds 19 (29.69%) were shallow, 27 (42.19%) were medium and 18 (14.29%) were deep ponds. Among large community ponds 8 (14.29%) were shallow, 15 (26.79%) were of medium depth ponds and 33 (58.92%) were deep ponds. Majority of community ponds

were deep and medium deep. Only 22.50% ponds were shallow.

The maximum depth of small ponds ranged from 85.00 cm to 275.00 cm and average depth was 147.70 cm. The maximum depth of large ponds ranged from 90.00 to 295.00 cm and average depth was 182.70 cm.

The total area under small ponds under study was 43.41 ha and average size of small ponds was 0.68 ha. The total area under large community ponds surveyed was 97.95 ha and average size of large fishponds was 1.75 ha. Total surveyed pond area was 141.36 ha.

The range of pond size in case of small ponds varied from 0.12 ha to 0.95 ha while the range of large ponds surveyed were 1.00 to 4.25 ha.

In case of small ponds 14(21.875%) were rainfed ponds, 24(37.50%) small ponds were ground water fed and 26(40.625%) small ponds were canal fed ponds. In case of large community ponds, 21(37.50%) were ground water fed, 18(32.14%) were rainfed and 17(30.36%) were canal fed ponds.

46(71.875%) small ponds were seasonal and 18 (28.125%) were perennial ponds, whereas 33(58.92%)

large ponds were perennial and 23(41.07%) were seasonal ponds.

From physical status discussed in this section, it shows that community ponds were good for scientific fish culture.

B. <u>Culture practices of small and large fish farmers in C.F.F.</u>:

1. <u>Seed collection in C.F.F. system</u>:

Majority of small fish farmers 28 (43.75%) and 20 (35.71%) large fish farmers collect fish seed from hatchery. 16 (25.00%) small fish farmers and 12 (21.43%) large fish farmers collect seed from river (Jamuna). 20 (31.25%) small fish farmers and 24 (42.86%) large fish farmers buy seed from hawker, who collect seed from Howrah (West Bengal).

Majority of small fish farmers collects seed from local hatchery and majority of large fish farmers collects seed, which are supplied from Howrah, West Bengal.

There was no significant difference between small and large fish farmers regarding their seed collection practice. Both collect fish seed from where seed is easily available and good in quality.

2. **Stocking combination of seed in C.F.F. system:**

Indian major carps (Catla, Rohu and Mrigal) are most popular stocking combination in C.F.F. system. Among exotic carps only common carp is popular among both small and large fish farmers. 46(71.875%) small fish farmers and 30(53.51%) large fish farmers prefer the Indian major carps as stocking combination, i.e. 3-spp combination. 18(28.25%) small fish farmers and 22 large fish farmers prefer the 4-spp combination (3 Indian major carps and common carp fish spp). Only 4 (7.14%) large fish farmers culture 6-spp combination (3 major carps and 3 exotic carps).

There was significant difference between small and large fish farmers regarding their stocking combination. Large fish farmers keenly prefer exotic carp along with Indian major carps as a stocking material.

3. **Stocking density & stocking size of fish seed:**

16 (25.00%) small fish farmers and 14 (25.00%) large fish farmers stock fry stage fish seed with 10,000-20,000 capacity. 16(25.00%) small and 14 (25.00%) large fish farmers stock fry stage seed with 20,001 and above/ha capacity. 14(25.00%) large fish

farmers and 16(25.00%) small fish farmers stock fingerling stage fish seed with 5,000 to 8,000/ha capacity and 14(25.00%) large and 16 (25.00%) small fish farmers stock fingerling stage fish seed with 8001 and above/ha capacity.

There is no significant difference regarding stocking density and stocking size of fish seed in between small and large fish farmers.

4. **Types of feed used in C.F.F. system:**

It was found that only 8 (12.5%) small fish farmers depended on natural fish food, i.e. plankton, which grown in pond water. They did not provide any supplementary feed. 31(48.44%) small fish farmers used rice bran/rice polish as supplementary feed to fish and 25 (39.06%) small fish farmers used balanced supplementary feed, i.e. rice bran and mustard oil cake to their pond as fish feed. On the other hand, all large fish farmers provided supplementary feed besides plankton, which is natural food. Majority of large fish farmers 35 (62.50%) provided balanced supplementary feed, i.e. rice bran and mustard oil cake, which is locally available fish feed. 21

(37.50%) large fish farmers provided only rice bran / rice polish as feed.

There was significant difference between small and large fish farmers regarding type of fish feed they use. Large fish farmers were more scientifically advanced and particular in providing balanced diet to fish.

5. **Feeding method used by fish farmers in C.F.F. System:**

Out of the small fish farmers, only 56 fish farmers provide supplementary feed to fish. 8 small fish farmers depended on only natural fish food, i.e. plankton.

Maximum number of 29 (51.29%) small fish farmers out of 56 and 31 (55.36%) large fish farmers preferred bag feeding method, followed by broad casting method, which 23 (41.07%) small and 19 (33.93%) large fish farmers preferred. 4 (7.14%) small and 6 (10.71%) fish farmers used basket-feeding method.

6. **Level of feed applications with their recommended rate in C.F.F. system:**

Large fish farmers use more feed (1606.85 kg/ha) than the small fish farmers (1325.34 kg/ha). Small

fish farmers use feed 53.01% of recommended rate whereas large fish farmers use feed 64.27% of recommended rate.

7. **Types of manure used in C.F.F. system:**

It was found that most of the small fishers 40(70.31%) and 42(75.00%) large fish farmers manure their ponds with cattle dung which is easily available in villages. 14(21.88%) small and 8(14.29%) large fish farmers manure their ponds with duck droppings and only 5(7.81%) small fish farmers and 6(10.71%) manure their ponds with poultry litter. Pig manure is totally absent in study area because community ponds are used in other purposes also.

There was no significant difference between small and large fish farmers as regards types of manure they used.

8. **Level of manure application with their recommended rate in C.F.F. system:**

It was found that small fish farmers use cattle dung 31.60% of recommended rate and large fish farmers use cattle dung 26.80% of recommended rate. In case of poultry litter, small fish farmers use only 11.25% of recommended rate and large fish farmers use 13.89% of recommended rate. In case of

duck dropping, small fish farmers use 21.67% and large fish farmers 22.80% of recommended rate.

The community fish farmers use low amount of manure than recommended doses, because village ponds are rich in organic manure and in rainy season the load of organic matter increases.

9. <u>Use of lime in C.F.F. system</u>:

The maximum number of large fish farmers 40(71.43%), and 31(48.43%) small fish farmers occasionally use lime in their ponds. 19(29.69%) small fish farmers and 10(17.86%) large fish farmers use lime only at the time of pond preparation. Small number of large fish farmers 6(10.71%) and 14(21.88%) small fish farmers uses lime at regular intervals.

There was significant difference between small and large fish farmers regarding their use of lime. Small fish farmers are more particular in using lime at regular intervals for maintaining proper pH level.

10. <u>Level of lime application with their recommended dose</u>:

It was found that large fish farmers use average 309.40 kg/ha of lime in a year and percentage of recommended doses was 15.47%. Small fish farmers use

average 252.03 kg/ha/year and percentage of recommended dose was 12.60%.

It was found that large farmers used comparatively high doses of lime than the small farmers.

11. <u>Nets used during the time of harvesting in C.F.F. system:</u>

It was found that dragnets are commonly used by both small 44 (68.75%) and large 37 (66.07%) fish farmers 20 (31.25%) small and 14 (25.00%) large fish farmers used gill nets. Cast net used only by small amount of large fish farmers 5 (8.93%).

These nets were used for commercial catch from ponds. Traps, hooks and lines were used for only catching few fish for household use.

There was significant difference between small and large fish farmers regarding net. Large fish farmers used different types of net, viz. gillnet, dragnet and cast net.

12. <u>Number of netting takes place during cultivation period in C.F.F. system:</u>

Majority of small fish farmers 28(43.76%) harvested their produce 1 to 2 times, 24(37.50%) small fish farmers harvested their produce 3 to 4

times in a year and 12 (18.75%) harvested their produce more than 4 times in a year for complete harvesting. On the other hand, 24 (42.86%) large fish farmers harvested fish more than 4 times and 18(32.14%) large fish farmers harvested fish 1 to 2 times and 14(25.00) large fish farmer harvested 3 to 4 times in a year.

Small fish farmers harvested their produce 1 to 2 times, because mostly they borrowed nets on rent and large fish farmers had their own net.

There was significant difference between small and large fish farmers regarding number of netting.

C. Personal profile and socio-economic status of small and large fish farmers in C.F.F.:

1. Age of fish farmers:

The highest number of small fish farmers 34(53.125%) under middle age group people (30-50 years) and 32(57.14%) large fish farmers were also under middle age group people. 22(34.375%) and 18(32.14%) small and large fish farmers respectively were in young age group (20-35 years interval). 8(12.50%) small fish farmers were under old age group (50-65 years) whereas 6(10.72%) large fish farmers were in same age group.

There was no significant difference between small and large fish farmers regarding their age. Both small and large fish farmers were middle aged. It may be due to nature of fish farming as business. It requires lot of efforts and resources to establish the business. Therefore, comparatively older age and experience are required for fish farming business.

2. **Caste of fish farmers:**

Out of 120 fish farmers 108(90%) were Hindu in religion and 12(10%) were Muslim in faith. The maximum number of small fish farmers and large fish farmers belonged to 'mallah' community being 97(61.76%) and 33(18.75%) respectively. This was followed by Harijans, which were 14 (23.33%) among small fish farmers and 9 (18.75%), among large fish farmers. There are some other castes also, like Thakur, Yadav and Patel, which were in small in number among small and large fish farmers.

Therefore, it may be concluded that 'Mallah' caste is major caste among the small and large fish farmers. Lowest number of small and large fish farmers belonged to high caste that shows the breaking of the caste barrier. This is welcome.

There was no significant difference between small and large fish farmers regarding their caste. Mostly all of them belonged to 'Mallah' caste.

3. **Education level of fish farmers:**

It was found that 18(28.13%) small fish farmers were illiterate and a few number of small fish farmers 7(10.94%) could read and write, whereas 7(12.50%) large fish farmers were illiterate and 5(8.93%) of large fish farmers could read and write. The maximum number of small fish farmers 14(21.88%) had education level equal to Junior High School, followed by High school level 9(14.06%), Primary school and upto intermediate level 8(12.50%) each. The maximum number of large fish farmers 19(33.93%) had education level equal to Junior High School, followed by High School level 11(19.64%), Intermediate level 8(14.29%), Primary level 4(7.14%) and only 2(3.57%) large fish farmers had graduation level of education.

There was significant difference between small and large fish farmers regarding their education. Large fish farmers had more education than small fish farmers.

4. **Experience of fish farmers in C.F.F.:**

Majority of small fish farmers 38(59.375%) and 35(62.50%) large fish farmers had 5-10 years experience in community fish farming. About 16(25.00%) and 8(14.29%) of small and large fish farmers respectively had below 5 years experience. In small and large fish farmers, there was 10(15.625%) and 13(23.21%) respectively had experience above 10 years.

There was no significant difference between small and large fish farmers regarding their experience in community fish farming. Both had medium level of experience in C.F.F.

5. **Occupation of fish farmers:**

In majority of cases, fish farming was supplementary occupation while for only 38(31.67%) it was main occupation.

6. **Size of land holding of fish farmers:**

Majority of the small fish farmers 48(75.00%) and 43(76.79%) large fish farmers was having land holding of 0-4 hectares. There were small number of small fish farmers 4(6.25%) and 5(8.93%) large fish farmers who had land holding above 4 hectares.

12(18.75%) small fish farmers and 8(14.28%) large fish farmers were landless.

There was no significant difference between small and large fish farmers regarding their size of land holding.

7. **Family size of fish farmers:**

It was found that 29(45.31%) small fish farmers belonged to medium sized family with 6-9 members. This was followed by small family size (2-5 members). 23(35.94%) fish farmers belonged to this category and 12(18.75%) had large families (10-13 members).

In case of large fish farmers, 32(57.14%) belonged to small family, followed by 14(25.00%) medium size and 10(17.86%) large size family.

There was significant difference between small and large fish farmers regarding their family size. Large fish farmers had small family than small fish farmers.

8. **Socio-economic status of fish farmers:**

Majority of small fish farmers 84(53.13%) and large fish farmers 30(53.57%) had medium socio-economic status. This was followed by 27(42.19%) small fish farmers and 16(28.57%) large fish farmers

who had low socio-economic status. There were 3(4.68%) and 10(17.86%) small and large fish farmers respectively had high range.

There was no significant difference between small and large fish farmers regarding their socio-economic status. They had the same socio-economic status.

ATTITUDE TOWARDS COMMUNITY FISH FARMING:

(i) Small fish farmers were strongly agreed or simply agreed on the following statements:

1. Taking loan for farming is a complicated process and hence everyone can not avail it.
2. Training from F.F.D.A. has helped fish farmers in better yield.
3. Marketing facilities for fish farming are inadequate and need improvement.
4. Community fish farming is a profitable enterprise.
5. Even people of high caste can successfully adopt community fish farming.

(ii) Small fish farmers were strongly disagreed or simply disagreed on the following statements:

1. Community fish farming can best be done by 'Mallah' community.

2. The present procedure of granting Patta (lease) to fish farmers is satisfactory and need no improvement.

3. Community fish farming system is not successful because village community ponds are used for other purposes also.

4. Community fish farming is only for rich and influential people of the village.

5. Community fish farming is a risky and complicated affair.

(iii) <u>**Small fish farmers were undecided on the following statements**</u>:

1. The supply of inputs like fingerlings and feeds etc. is timely and adequate.

2. Fish farming is a must to supplement the improvement diet of the people.

3. Facilities provided by F.F.D.A. are enough.

4. The loan given for fish farming are not being regularly recovered.

(iv) <u>**Large fish farmers were either strongly agreed or simply agreed on the following statements**</u>:

1. The supply of inputs like fingerlings and feed etc. is timely and adequate.

2. Training from F.F.D.A. has helped fish farmers in better yield.
3. Marketing facilities for fish farming are inadequate and need improvement.
4. Community fish farming is a profitable enterprise.
5. Facilities provided by F.F.D.A. are enough,
6. Even people of high caste can successfully adopt community fish farming.
7. The loans given for fish farming are not being recovered.

(v) **Large fish farmers were strongly disagree or simply disagreed on the following statements:**

1. Community fish farming can best be done by 'Mallah' community.
2. The present procedure of granting Patta (lease) to fish farmers is satisfactory and need no improvement.
3. Community fish farming system is not successful because village community ponds are used for other purposes also.
4. Taking loan for fish farming is a complicated process and hence everyone can not avail of it.

5. Community fish farming is only for rich and influential people of village.
6. Community fish farming is a risky and complicated affair.

(vi) <u>Large fish farmers were undecided on the following statements</u>:

1. Fish farming is a must to supplement the improvement diet of the people.

The test of significance clearly shows that both small and large fish farmers had favourable attitude about community fish farming.

DEVELOPMENT OF FALLOW, UNPRODUCTIVE AND MARGINALLY PRODUCTIVE LANDS AND EMPLOYMENT GENERATION

1. Development of existing water area in study area:

Total 34 unproductive ponds converted into fish-ponds, of which 23 were small ponds covering area of 16.20 ha and 11 were large ponds covering area of 14.60 ha in the selected villages of the study area.

31 small marginally productive waterlogged areas covering 19.78 ha converted into improved fishponds and 29 large marginally productive waterlogged areas covering 39.22 ha converted into fishponds in the selected villages of study area. Total 94 waterlogged areas converted into fishponds, which became source of income and employment to rural people.

2. Types of development of existing ponds in the study area:

23 small ponds totalling water area of 14.20 ha were partially developed by removing the sub-merged aquatic weeds and wild, economically unimportant fishes, whereas in case of large ponds 29 ponds with 35.12 ha water area were partially developed by removing the aquatic weeds and wild fishes.

24 small ponds covering total area of 16.64 ha and large ponds covering 10.60 ha water area were developed by maintaining the embankment or bundhs.

7 small ponds covering an area of 5.14 ha, partially developed with boring and 5 large ponds covering 8.10 ha water area was developed by partial boring.

It shows that the village community ponds, which were unproductive and marginally productive, converted into productive fishponds and gave better environment to villages as well as better income to local rural youth.

3. **Development of fallow agriculturally wasteland converted to new fishponds**:

The data were collected from the selected villages of the study area. These ponds were personal ponds not community ponds. So, economics and other studies could not be undertaken in the study.

Total 11 new ponds were constructed in the selected villages covering 11.25 ha water area. Fallow land converted into fish seed hatchery covering a water area of 4.00 ha, which supplies seed to fish farmers of Allahabad and its neighbouring districts.

4. <u>Employment pattern in community fish farming system:</u>

Average mandays generated/ha/year from small ponds were 28.75 days and 66.12 days for casual workers and permanent workers (family) respectively and 51.84 days and 68.62 days for casual workers and permanent workers (family) respectively from large ponds. Here it was found that more days casual worker and permanent worker worked in large ponds than small ponds.

0.76 hrs./day/ha and 1.76 hrs./day/ha casual workers and permanent workers respectively worked in small ponds, whereas 1.38 hrs./day/ha and 1.82 hrs./ day/ha casual worker and permanent workers worked in large ponds. It shows that fish farming is good as supplementary (secondary) occupation.

Total mandays generated per year due to development of existing ponds were 3413.43 mandays and 6483.13 mandays for small and large ponds respectively.

It can be concluded that fish farming is good source of employment for rural people. They adopted it as supplementary source of employment besides other primary occupation.

ECONOMICS OF COMMUNITY FISH FARMING:

For comparing the economics of fish culture with different stocking sizes and stocking densities, the crops were grouped into four categories based on stocking density and stocking size separately for small ponds and large ponds. For small fishponds, the four categories of rates and size were:

a. Fry stage with stocking density 10,000-20,000/ha /year (SPA);

b. Fry stage with stocking density 20,001 and above /ha/year (SPB);

c. Fingerling stage with stocking density 5,000 - 8,000/ha/year (SPC); and

d. Fingerling stage with stocking density 8,001 and above/ha/year (SPD).

The four categories for large ponds were at stocking rates and sizes:

a. Fry stage with stocking density 10,000-20,000/ ha/year (LPA);

b. Fry stage with stocking density 20,001 and above /ha/year (LPB);

c. Fingerling stage with stocking density 5,000- 8,000/ha/year (LPC); and

d. Fingerling stage with stocking density 8,001 and above/ha/year (**LPD**).

1. **<u>Cost of Production of fish under different stocking density and stocking size in community fish farming in small ponds</u>:**

Total fixed cost for the culture of carps in small ponds for the SPA, SPB, SPC and SPD categories were Rs. 1037.20, Rs. 880.51, Rs. 1049.12 and Rs. 1028.69 /ha/year respectively. The sample average was Rs. 998.89/ha/year. These constituted 5.57%, 3.65%, 4.17% and 3.57% of the total cost respectively. The total variable cost for first group SPA was Rs. 17,571.11/ha/year, out of which 16.66% went towards the cost of feed; for the second group SPB, the total variable cost was Rs. 23,201.19/ha/year of which 19.83% was spent towards feed. Hence, it is evident that in same stocking size (fry stage) as the stocking density increased the total variable cost also increased and feeding cost also increased. it is also found that cost of seed also increased SPA 10.53% to SPB 11.64%.

The total variable cost for the third group SPC was Rs. 24,131.28/ha/year, out of which 19.83% went towards the cost of feed; for the fourth group SPD,

the total variable cost was Rs. 27,780.94/ha/year of which 19.76% was spent towards feed. Hence, it is evident that in same stocking size (fingerlings) as the stocking density increased the total variable cost also increased. However, the feeding cost slightly decreased in fourth group SPD because for proper management of fish ponds the SPD fish farmers harvest fish in between the final harvest which help in decreasing the feeding cost in fourth group.

In case of 3^{rd} and 4^{th} group, seed cost also increased which were Rs. 4,371.88 and Rs. 4,681.25 respectively.

It is found that the cost of manure increased but percentage of total cost of manure decreased with stocking density. In case of fry stage stocking SPA and SPB, cost of manure was Rs. 2,765.63/ha/year and Rs. 3,191.25/ha/year respectively, constituted 14.86% and 13.25% of the total cost respectively, which indicates that farmer pays more for supplementary feed than the manure which help in plankton production. In case of fingerlings, stocking of SPC and SPD group, cost of manure increased with stocking density, which was Rs. 3,293.75/ha/year and Rs.

3,434.38/ha/year respectively. But percentage of total cost, i.e. 13.08% and 11.91% respectively, decreased with stocking density.

The percentage of total cost of hired labour and family labour both decreased with increase of stocking density. The cost of hired labour for SPA and SPB categories were Rs. 1130.00/ha/year and Rs. 1276.25/ ha/year respectively. These constituted 6.07% and 5.30% of the total cost respectively. The cost of hired labour for SPC and SPD categories were Rs. 1354.38/ha/year and Rs. 1415.00/ha/year. These constituted 5.37% and 4.91% of the total cost respectively.

The cost of family labour for SPA and SPB categories was Rs. 2780.00/ha/year and Rs. 2840.63/ ha/year respectively. These constituted 14.94% and 11.79% respectively. The cost of family labour for SPC and SPD categories was Rs. 3103.13/ha/year and Rs. 3177.50/ha/year respectively. These constituted 12.32% and 11.03% of the total cost respectively.

Sample average of small farms shows that cost of feed is a major share of the total cost, which was Rs. 4638.67/ha/year (19.19% of the total cost). It is

followed by cost of seed, which was Rs. 3453.83/ha/year (14.29% of the total cost) and manure - Rs. 3171.25/ha/year (13.12%) of the total cost.

Present analysis reveals that variable cost accounts for more than 95% of the total cost, while fixed cost constitute 5% of the total cost because all the farmers use ponds taken on lease.

2. **Economics of community fish farming in small ponds:**

The average production of fish obtained from the SPA group was 1551.25 kg/ha; from SPB group 2375.00 kg/ha; from SPC group 2536.00 kg/ha; and from SPD group 2973.00 kg/ha, showing that production increased with increase in stocking sizes and stocking densities. The total returns obtained from SPA was Rs. 38,005.63/ha/year; Rs. 58,187.50/ha/year from SPB; Rs. 62,132.00/ha/year from SPC; Rs. 72,838.50/ha/year from SPD and Rs. 57,790.85/ha/year from sample average. The net return was Rs. 19,397.32, Rs. 34,105.80, Rs. 36,951.60 and Rs. 44,028.90/ha/year respectively, showing an increase in profitability with increase in stocking size as well as stocking density. This is due to the fact that in fingerling stage mortality rate of seed is

lower that that of fry stage and increased stocking density increases the profitability.

It is observed that family labour income per year of Rs. 22,177.32, Rs. 36,946.43, Rs, 40,054.73, Rs. 47,206.40 and Rs. 36,593.54 for SPA, SPB, SPC, SPD and sample average respectively.

The input-output ratio is estimated to be 2.04, 2.42, 2.47, 2.53 and 2.39 for each of the four groups and sample average respectively. The average cost of production of 1 kg of fish was Rs. 11.99, Rs. 10.14, Rs. 9.93 and Rs. 9.69 for first, second, third and fourth groups respectively. This indicates that cost of producing one kg of fish was cheaper with higher stocking densities and big stocking material (fingerlings) compared to the lower stocking density and small sized stocking material (fry).

From the above, it may be concluded that stocking size and stocking density plays an important role in successfulness of fish farming. In this case, group four SPD, where stocking size is bigger (fingerlings) and stocking density is high, profitability is also high.

3. **<u>Cost of Production of fish under different stocking density and stocking size in community fish farming in large ponds</u>:**

The fixed cost for the culture of carps in large ponds for the LPA, LPB, LPC and LPD categories were Rs. 1037.45, Rs. 1054.58, Rs. 1118.42 and Rs. 1062.67 /ha/year respectively. The sample average was Rs. 1064.39/ha/year (3.99% of total cost). This constituted 4.93%, 3.96%, 4.07% and 3.38% of the total cost respectively.

The total variable costs worked out to Rs. 20,026.03, Rs. 26,631.68, Rs. 27,449.52 and Rs. 31,448.14/ha/year for four groups respectively, which constituted 95.07%, 96.04%, 95.93% and 96.62% of their total cost. Of this, 14.93% and 17.59% were used for feed for first and second groups. Hence, it is evident that in same stocking size (fry stage) as the stocking density increased the feeding cost increased. it is also found that cost of seed also increased LPA 8.92% to LPB 10.49%.

In case of 3rd and 4th groups, 17.41% and 17.14% were used for feed. It is evident that in same stocking size (fingerlings) as the stocking density increases, the cost of feed Rs. 4778.71/ha/year and

Rs. 5388.71/ha/year respectively were increased. However, the percentage of feeding cost slightly decreased in fourth group LPD because fish farmers harvest fish in between the final fish harvest, which help in decreasing the percentage of feeding cost in fourth group.

In case of 3rd and 4th group, seed cost also increased, which were Rs. 3571.07 and Rs. 4800.36/ha/year respectively.

It is found that cost of manure Rs. 3387.50, Rs. 4127.50, Rs. 4201.07 and Rs. 4676.79/ha/year respectively and constitute 16.08%, 15.49%, 15.30% and 14.37% of the total cost respectively.

In both stocking sizes increasing of stocking density decreasing of percentage of total cost for manure is found, which indicates that farmers pay more for supplementary feed than manure which help in plankton production, when stocking density increased.

The percentage of total cost of hired labour and family labour both decreased with increase of stocking density. The cost of hired labour for LPA and LPB categories were Rs. 1902.07 and Rs. 2334.36/ha/year respectively. These constituted 9.03%

and 8.77% of the total cost respectively. The cost of hired labour for LPC and LPD categories were Rs. 2386.07 and Rs. 2708.29/ha/year. These constitute 8.69% and 8.61% of the total cost respectively.

The cost of family labour for LPA and LPB categories was Rs. 2882.86 and Rs. 2960.71/ha/year respectively. These constituted 13.67% and 11.12% of the total cost respectively. The cost of family labour for LPC and LPD categories was Rs. 3114.29 and Rs. 3394.29/ha/year respectively. These constituted 11.35% and 10.79% of the total cost respectively.

Sample average of large farm shows that cost of feed is major share of the total cost, which was Rs. 4499.16/ha/year (16.89% of total cost). It is followed by cost of manure, which was Rs. 4098.21 (15.38% of total cost) and seed Rs. 3253.39/ha/year (12.21% of total cost).

Present analysis reveals that variable cost accounts for more than 95% of the total cost while fixed cost constitutes merely 5% of the total cost because all the farmers use ponds taken on lease.

4. <u>Economics of community fish farming in large ponds</u>:

The average production of fish obtained from LPA, LPB, LPC and LPD group was Rs. 37,362.50, Rs. 52,552.50, Rs. 65,292.50 and Rs. 78,057.00/ha/year respectively, with a net return of Rs. 16,298.47, Rs. 25,920.82, Rs. 37,842.98 and Rs. 46,608.80/ha/year respectively, showing an increase in profitability with increase in stocking density.

It is observed that family labour income per year of Rs. 19,181.33, Rs. 28,881.53, Rs. 40,957.27, Rs. 50,003.15 and Rs. 34,759.74/ha/year for LPA, LPB, LPC, LPD and sample average respectively.

The input-output ratio is estimated to be 1.77, 1.97, 2.38 and 2.48 for each of the four groups respectively. The average cost of production was Rs. 13.81, Rs. 12.42, Rs. 10.30 and Rs. 9.87/kg for 1st, 2nd, 3rd and 4th groups respectively. These indicate the cost of producing one kg of fish was cheaper with higher stocking density and big stocking material (fingerlings) compared to the lower stocking density and small stocking material (fry).

PROBLEM IN C.F.F. SYSTEM:

Jamunapar region of Allahabad district endowed with natural resources and human skills for taking up intensive fish culture, but the gap between actual and potential yield continues to persist. The new technology which seems technically feasible, has failed to produce substantial results in the field condition.

For rapid dissemination of the technology, it is necessary to identify the problems.

Problems in C.F.F. System as perceived by fish farmers:

"Non availability of credit" (31.10% of total weightage) has been perceived by the fish farmers as the most important problem in C.F.F. system. The second most important problem as perceived by the fish farmers was "lack of knowledge" (16.10% of total weightage) in adopting the carp culture technology. "Erratic supply of quality fish seed" especially exotic carps viz. silver carp, grass carp and common carp at reasonable price and specific time poses a serious constraint in the rural area. Most of the farmers used fish seed with the mixture of Catla, Rohu and Mrigal and small sized seed (fry stage/early

fry stage) collected from various hatcheries, are directly stocked in ponds resulting in poor survival. This has been perceived as the third important problem perceived by the farmers.

"High cost of inputs" (8.80%) and "low and fluctuating price of fish at farm gate" (7.50%) has been perceived as fourth and fifth major problems in C.F.F. System.

"Poaching" (5.00%) was considered a major inhibiting factor, ranked sixth in position, "lack of suitable organised market" (4.40%) "non retention of water throughout the year" (4.20%), "Fish disease" (4.00%) and "poisoning of ponds" (3.60%) has been perceived as seventh, eighth, ninth and tenth respectively as common problems in C.F.F. System.

Analysis of problems with root cause in C.F.F. System:

The above ten problems are grouped into five sub-sections, Viz.:

(1) **Financial Constraints (39.90%)** major problem in C.F.F. System. Main root causes are:

(i) The banks require project prepared by the fish farmers, who are by and large uneducated and ill informed; and

(ii) The fish farmers are often landless daily labourers who have nothing to offer as security for the loans.

(2) Extension gap (20.10%), ranked second in position. Extension of scientific methods to rural areas still remains largely inadequate. The main root causes are:

(i) The fish farmers are either inadequately trained without practical based training programme or not trained at all;

(ii) Multi-ownership and unwillingness hampers the acceptance of modern technology; and

(iii) Fish farmers are unaware about fish diseases.

(3) The third most important constraint is **Non availability of basic inputs / resources (19.50%)**. Root causes are:

(i) Lack of exotic carp seed hatcheries has compelled the farmers in rural areas to resort to culture employing indigenous carp only;

(ii) Large ponds invariably have predatory fish population, the control of which is not feasible through de-watering or using fish toxicant since

these ponds are mainly meant of multi-purpose use;

(iii) They are stocked with fry (small sized fish seed), the chances of survival of which is very meagre and consequently they do not yield much;

(iv) Most of the fish farmers used fish seed with mixture of Catla, Rohu and Mrigal, because hatcheries supply mixed seed; and

(v) Water level decline in ponds during summer months and most of the farmers use pond water for irrigation of different crops.

(4) Marketing Problem (11.90%) mentioned by the farmers as fourth major problem. The root causes are:

(i) Lack of infrastructural facilities like cold storage, good approach roads from landing sites to marketing centres and quick transport; and

(ii) The fish markets are controlled by powerful groups of middlemen who buy from the producers at low price at farm gate.

(5) Social constraints (8.60%) are poaching and poisoning. Organised dacotees have become a serious problem. Major root cause of poaching is

lack of proper monitoring. Economic competition among farmers is the root cause of poisoning of ponds.

MEASURES SUGGESTED BY THE FISH FARMERS IN INCREASING THE YIELD OF FISH:

1. The fish farmers suggested 'provision of credit' (29.17%) to purchase necessary inputs as the prime requisite in the process of adoption of high yielding technology. The banks or other Financial Institutions need to float liberal credit policies to support fish farmers in a big way.

2. 'More exposure to technology' (25.00%) ranked second suggested measure. Knowledge regarding maintenance of ponds' hygiene and fish health care merits a special attention in making aquaculture a profitable venture. To gear up the fisheries extension services, we required not only strengthening by way of additional suitably trained manpower, but also regular provision of additional publicity material.

3. 'Supply of good quality carp seed' (17.50%) for fish culture forms the third important priority measure suggested by fish farmers. The finding

underlines the need for producing more seed of exotic carps to fill the gap. Perhaps good quality carp seed could be attained by training the farmers to rearing fry in their own nursery ponds.

4. Among the measures suggested by the fish farmers, 'marketing through organised sector' (15.83%). Organised arrangements for storage and marketing of fish are necessary and would be helpful in stabilising price structure to benefit both - the producer and consumer. Efficient Co-operative marketing organisations may minimise and ultimately do away the vicious circle of the middlemen. The fish farmers may take up the operation without any uncertainty associated with prices.

5. The fish farmers considered the control of 'poaching and poisoning (12.50%)' of ponds as the fifth important measure favouring culture of fish. Social awareness and educating the villagers, especially the youth force, might reduce the intensity of the problem.

CONCLUSIONS

Based on the above findings, the following tentative conclusions were arrived at:

PRESENT STATUS OF COMMUNITY FISH FARMING:

1. Most of the small ponds were seasonal and medium deep and canal fed;
2. Most of the large ponds were perennial deep ponds and ground water and canal fed;
3. Majority of small fish farmers collect seed from local hatchery and majority of large fish farmers collect seed which are supplied from Howrah, West Bengal;
4. Indian major carps (Catla, Rohu and Mrigal) were most popular stocking combination in C.F.F. System;
5. Both, small and large fish farmers, stocked their pond with fry and fingerling stage with different stocking density;
6. Majority of large fish farmers provide balanced locally available supplementary feed (Rice bran + Mustard oil cake). Most of the small fish farmers used rice bran/rice polish as supplementary feed;

7. Both, small and large fish farmers, preferred bag feeding method followed by broad casting method;
8. Both, small and large fish farmers, use feed below the recommended rate;
9. Cattle dung was popular pond manure for small and large fish farmers. Pig manure is totally absent in study area;
10. The community fish farmers use low amount of manure;
11. The maximum number of large fish farmers occasionally used lime in their pond in low amount than recommended dose;
12. Dragnets were commonly used by small and large fish farmers; and
13. Most of the small farmers harvested their produce 1 - 2 times in a year whereas large fish farmers harvested fish more than 4 times.

PERSONAL PROFILE:

1. Both, small and large fish farmers, were mostly middle age group people;
2. 'Mallah' caste were major caste among both small and large fish farmers;

3. Large fish farmers had more education than small fish farmers;
4. Majority of fish farmers had 5-10 years' experience in community fish farming;
5. Majority cases of fish farming was supplementary occupation;
6. Majority of fish farmers were having land holding 0-4 ha;
7. Large fish farmers had small family than small fish farmers; and
8. Majority of small and large fish farmers had medium socio-economic status.

ATTITUDE:

Both, small and large fish farmers, had favourable attitude about C.F.F. System.

DEVELOPMENT OF FALLOW, UNPRODUCTIVE AND MARGINALLY PRODUCTIVE LAND AND EMPLOYMENT GENERATION:

The village community ponds which were unproductive and marginally productive, converted into productive fishponds and gave better environment to villages as well as better income and employment to local rural youth.

ECONOMICS:

Small ponds and large ponds:

1. Variable cost accounts for more than 95% of the total cost while fixed cost constitutes merely 5% of the total cost, because all the fish farmers used pond taken on lease;
2. Cost of feed and seed increased with stocking density;
3. Percentage of total cost of manures decreased with stocking density;
4. Cost of feed is a major share of the total cost, followed by the cost of seed;
5. Cost of producing one kg of fish was cheaper with higher stocking density and big stocking material (fingerlings) compared to the lower stocking density and small sized stocking material (fry); and
6. Stocking size is bigger (fingerlings) and stocking density is high, profitability is also high.

PROBLEM IN C.F.F. SYSTEM:

Problems as perceived by fish farmers:

1. Non availability of credit;
2. Lack of knowledge;
3. Erratic supply of quality seed;
4. High cost of Inputs;
5. Low and fluctuating price at farm gate;
6. Poaching;
7. Lack of suitable organised market;
8. Non retention of water throughout the year;
9. Fish diseases; and
10. Poisoning.

MEASURES SUGGESTED BY FISH FARMERS:

1. Provision of credit;
2. More exposure to technology;
3. Supply of good quality seed;
4. Marketing through organised sector; and
5. Control of poaching and poisoning.

RECOMMENDATIONS

In the light of present findings, review of relevant literatures, investigations, own observations and experience, the following recommendations are put forth to minimise the gap between actual and potential yield of fish to enhance the revenue of fish farmers in C.F.F. System:

1. Advanced seed rearing techniques should be adopted for raising seed in nursery ponds. The spawn and fry of commercially important varieties caught in river flood plain can be stocked in nurseries and rearing spaces where these frys can be housed for better survival. They can be released later into the village community ponds;
2. Stocking density of 8,000 to 15,000 fingerlings/ha in composite fish culture system may be adopted. Stocking density is not the only factor, which affects the production from a fishpond. The comparative economics of different stocking densities show that the potential of semi intensive fish farming with higher stocking densities in this study area, can be further improved by upgraded scientific culture methods;

3. Stocking of disease free and acclimatised healthy carp seeds should be adopted;
4. Good quality of water with rich oxygen content is recommended for culture of carp species;
5. The water should be made available at cheap rates through canals in summer time;
6. Proper management practice should be adopted to prevent deterioration in pond water quality;
7. Application of lime should be adopted regularly during the culture period, so as to keep pH variation in pond water within the range of 7 - 7.5;
8. Using local fish food ingredients, an appropriate cost-effective diet has to be developed with better F.C.R. in order to make grow out operation economically viable;
9. Laying of emphasis on the prophylaxis of fish diseases as a preventive measure;
10. Fishing equipment should be made easily available from F.F.D.A.;
11. Popularisation of integrated fish farming (fish-duck, fish-livestock, fish-poultry, fish-horticultural crop) to avoid economic risk;

12. Organising better marketing facilities and transportation to the site can further enhance the income. The interference of the middlemen regarding marketing should be minimised to help the fish farmers to get actual value of their work;
13. Creation of efficient post-harvest and marketing network with adequate hygienic facilities for storage and marketing to cover various centres of demand and to facilitate farmers to get remunerative prices for their produce;
14. A greater level of co-ordination is needed between the researcher and the field extension workers;
15. Well designed extension programmes through different media are needed to be implemented to educate people on different aspects of fish farming practices;
16. Depending upon suitability of areas, training programmes needed to be organised to encourage adoption of carp culture by farmers. This will help in promoting awareness towards potential of carp culture;

17. Periodical training and motivation should be imparted to all the concerned by effective extension teaching methods, like field trips, demonstration, group discussion, meetings, drama and puppet-show etc.;
18. The establishment of model fish farming demonstration unit to show results of new practices would be helpful in accelerating fish farming business;
19. The Fisheries Department should be established at the Block level for proper supervision;
20. The staff of Fisheries Department should visit the community ponds periodically to offer suitable suggestions about fish diseases and feeding of fish;
21. Bank employees should be kept under strict supervision;
22. Interest on bank loans should be reduced to encourage the fish farmers; and
23. The procedure of obtaining loans and 'Patta' should be simplified.

CHAPTER VI

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APPENDIX

APPENDIX - 1

THE PROFILE OF FISH CONSUMPTION

Sl. No.	Country	Fish Consumption (kg/capita/year)	Rank
1.	Arab Countries	5	XII
2.	Bangladesh	7	XI
3.	Hong Kong	55	III
4.	India	10	X
5.	Indonesia	19	VIII
6.	Japan	65	II
7.	Malaysia	45	IV
8.	Maldives	126	I
9.	Philippines	18	IX
10.	Singapore	40	V
11.	Sri Lanka	22	VII
12.	Taiwan	45	IV
13.	Thailand	25	VI
14.	U.S.A.	18	IX
	World	15	
	Developed Countries	25	
	Developing Countries	8	

Source: Intensive Agriculture 1999

APPENDIX - 2

INDIAN FISHERIES RESOURCES

Capture Fisheries Resources		Fresh Water Aquaculture	
Resources	**Physical Unit**	**Resources**	**Physical Unit**
Coastal Line	8.129 Km	Ponds and Tanks	2.25 million ha
Exclusive Economic Zone (EEZ)	2.02 million sq. km	Beeds and derelict waters	1.30 million ha
Brackish Waters	1.2 million ha	Lakes and Reservoirs	2.09 million ha
Rivers	28,000 km	Paddy fields	2.30 million ha
Irrigation Canals and Channels	1,13,000 km		

Source: CIFA, A Decade of Service to the Nation, 1998

APPENDIX - 3

AVAILABLE FRESH WATER RESOURCES OF UTTAR PRADESH FOR AQUACULTURE (1998 - 99)

Source of Water	Available Water area (lakh ha)	Utilised water area for fish (lakh ha)	Utilised percentage
1. Large and Medium reservoir	1.50	1.37	91.30%
2. Natural Tanks	1.33	0.05	3.07%
3. Village Ponds	1.62	0.86	53.10%
TOTAL	**4.45**	**2.28**	**51.24%**

Source: Karyapurti - Digdarshika, Fisheries Department, Lucknow, U. P., 1998-99

APPENDIX - 4

WATER RESOURCES UTILISATION IN UTTAR PRADESH

Year	Water Area (lakh ha)	Water area brought under aqua-culture (lakh ha)	% uti-lised in aqua-cul-ture	Total Produc-tion (t/ annum)	Export within the country	% of exp-ort of total pro-duc-tion	Produc-tivity (kg/ha)	Value (lakh Rs.)
1994-95	4.45	2.06	46.30	139903	1222	1.0	1750	38658.60
1995-96	4.45	2.17	48.76	145407	9290	6.0	N.A.	40649.47
1996-97	4.45	2.23	50.11	149425	9280	6.0	N.A.	42217.02
1997-98	4.45	2.27	51.01	160017	9200	5.7	2320	46994.70
1998-99	4.45	2.28	51.24	183030	5320	3.0	2350	55286.77

Source: Karyapurti - Digdarshika, Fisheries Department, Lucknow, U. P., 1998-99

APPENDIX - 5

FISH SEED PRODUCTION OF UTTAR PRADESH

Year	Target (lakh)	Production (lakh)	Import (lakh)
1994 - 95	5000.00	4792.48	742.93
1995 - 96	5500.00	5466.25	501.45
1996 - 97	6000.00	6187.93	292.28
1997 - 98	6500.00	6801.06	N.A.
1998 - 99	7000.00	7115.27	N.A.

Source: Karyapurti - Digdarshika, Fisheries Department, Lucknow, U. P., 1998-99

APPENDIX - 6

SCHEDULES FOR THE STUDY ON:

"Community Fish Farming System in Jamunapar region of Allahabad district in (U.P.) with special reference to economics and problem"

P A R T - I

I. HOUSE HOLD SCHEDULE:

A. Identification of respondent

(a) i. Name of the respondent ____________

ii. Father's name ____________

iii. Village ________ Block ________

iv. Sex ___ Age ___ Caste ___ Marital Status __

v. Occupation-Main ______ Subsidiary ______

vi. Literacy

Illite-rate	Can read & Write	Upto Primary	Upto High School	Upto Inter	Above Inter

vii. Trained in fish farming: ________ Year

viii. Experience: ____________

(b) Economic Status of fish farmers on the basis of:

Land Holding		Pond size	
i. Marginal (less than 1 ha) ii. Small (1 to below 2 ha) iii. Large (above 2 ha)		i. Small (less than 1 ha) ii. Medium (1 to below 2 ha) iii. Large (above 2 ha)	

B. **Details about the family and work force:**

Male	Female	Children		T	Workers		Non-Workers		Hired		Total	
		M	F		M	F	M	F	M	F	M	F

C. **Socio-economic status**: Please supply the following information with regard to your socio-economic status:

1. Education:

(a) Illiterate	(0)
(b) Upto Primary	(1)
(c) Upto High School	(2)
(d) Upto Intermediate	(3)
(e) Upto Graduation	(4)
(f) Graduation and above	(5)

2. Social Participation:

(a) Member in none	(0)
(b) Member in one organisation	(1)
(c) Member in more than one organisation	(2)
(d) Office Bearer	(3)

3. Caste:

(a) Scheduled Caste and Scheduled Tribe	(0)
(b) Backward Class	(1)
(c) Higher Caste	(2)
(d) Dominant Caste	(3)

4. House:

(a) Thatched House	(0)
(b) Kachcha House	(1)
(c) Mixed House	(2)
(d) Pucca House	(3)

5. Size of the land holding:

(a) Less than 5 acres	(0)
(b) Upto 10 acres	(1)
(c) Upto 20 acres	(2)
(d) Upto 40 acres	(3)
(e) 40 acres and above	(4)

6. Occupation:

(a) Farming and labour	(0)
(b) Farming and caste occupation	(1)
(c) Farming	(2)
(d) Farming and services	(3)

7. Farm Power:

(a) 1 - 2 Bullocks (0)
(b) 3 - 4 Bullocks (1)
(c) More than 5 Bullocks (2)
(d) Tractor (3)

8. Material Possessions:

(a) None (0)
(b) One farm animal (Bullock, Buffalo, Cow)/ Bicycle / Furniture (1)
(c) Two Farm Animals/Bullock Cart/ Radio (2)
(d) Three to four farm animals/Improved farm/Newspaper/Electricity (3)
(e) Five to ten farm animals (4)
(f) More than ten farm animals (5)

PART II TECHNICAL DETAILS REGARDING FISH FARMING:

1. Details about the fishponds:

Area of Pond and depth	Type of pond	Source of water	Year of const-ruction	Renovation of pond (✓)	Partial develop-ment with boring
				(1) Removal of aquatic weed and wild fish (2) Repair of Bundhs	

2. Input Supply pattern: (Seed Collection)

Riverine Collection (Rs./1000)	Collection from seed hatcheries (Rs./1000)	Supplied from Howrah (Rs./1000)

3. Stocking size and Stocking density:

I.M.C.	Size	Density/ha	Exotic Carp	Size	Density/ha
1. Catla			1. Silver carp		
2. Rohu			2. Grass carp		

3. Mrigal			3. Common carp		

4. **Level of major inputs applied:**

i. Lime (kg/ha) ______________

ii. Organic Manure (kg/ha)

a. Cattle dung ______________

b. Pig Dung ______________

c. Poultry manure ______________

d. Duck dropping ______________

iii. Fertiliser (kg/ha)

a. Urea ______________

b. Murate of Potash ______________

c. Super Phosphate ______________

vii. Feed of fish:

a. Depend upon only Plankton (natural feed)

b. Supplementary feed

* Rice bran/Rice polish ______________

* Mustard oil cake + Rice bran/rice polish ______________

* Others ______________

5. **Types of net used for harvesting (✓):**

(1) Gill net

(2) Cast Net

(3) Drag Net

(4) Traps

6. Total Harvesting in a year: ____________

PART III ATTITUDE TOWARDS COMMUNITY FISH FARMING:

Below are some statements to measure your attitude towards community fish farming. Please listen to each of these and express your responses in terms of the following:

SA - Strongly Agree

A - Agree

UD - Undecided

DA - Disagree

SDA - Strongly Disagree

Sl. No.	Statement	Responses
1.	Fish farming can best be done only by the 'Mallah' community	SA A UD DA SAD
2.	The present procedure of granting patta (lease) to fish farmers is satisfactory and needs no improvement	SA A UD DA SAD
3.	The supply of inputs like fingerlings and feeds etc. is timely and adequate	SA A UD DA SAD
4.	C.F.F. System is not successful because village community pond is used for other purposes	SA A UD DA SAD
5.	Taking loan for fish farming is a complicated process and hence everyone can not avail of it	SA A UD DA SAD
6.	Community fish farming is only for rich and influential people of village	SA A UD DA SAD

Sl. No.	Statement	Responses
7.	Training of fish farmers through F.F.D.A. has helped farmers in better yield	SA A UD DA SAD
8.	C.F.F. is a risky and complicated affair	SA A UD DA SAD
9.	Marketing facilities for fish farmers are inadequate and need improvement	SA A UD DA SAD
10.	C.F.F. is a profitable enterprise	SA A UD DA SAD
11.	Fish farming is a must to supplement the improvement diet of the people	SA A UD DA SAD
12.	Facilities provided by the F.F.D.A. are not enough	SA A UD DA SAD
13.	Even people of high caste can successfully adopt C.F.F.	SA A UD DA SAD
14.	The loans given for fish farming are not being regularly recovered	SA A UD DA SAD

PART IV ECONOMICS OF COMMUNITY FISH FARMING:

(A) Annual Expenditure:

Sl. No.	Particulars	Material			Labour		
		Qty	Rate	Value	Qty	Rate	Value
i.	Pre-stocking Mgt.						
1.	Pond drying						
2.	Weeding						
3.	Erradication of wild fish						

Sl. No.	Particulars	Material			Labour		
		Qty	Rate	Value	Qty	Rate	Value
4.	Repair & Maintenance of bundh						
5.	Watering						
6.	Liming and pH test						
7.	Manuring						
ii.	**Stocking Management**						
1.	Fish seeds						
2.	Transport charges						
iii.	**Post Stocking Mgt.**						
1.	Fish feed - Oil cake						
	- Rice bran/polish						
2.	Liming & pH test						
3.	Manuring						
4.	Fertilising						
5.	Fortnight netting						
6.	Harvesting						
iv.	**Marketing of fish:**						
1.	Transportation						
2.	Octroi						
3.	Marketing fee						
v.	**Lease charge**						
vi.	**Miscellaneous charges**						

(B) Inventory related to fish farming:

Sl. No.	Particulars	Qty	Date of purchase	Begin-ning Inventory Value	Depri. Value	Ending Value	Remarks
(i)	Pump Set						
(ii)	Procuring						
(iii)	Room						
(iv)	Boats						
(v)	Gears(Nets						
(vi)	Trolleys						
(vii)	Others						

(C) OUTPUT:

a. Total yield in whole year: ____________

(D) MARKETING OF CARPS:

Total catch	Quantity retained for self consumption (kg)	Marketable Surplus (kg)	Sale price (Rs. per kg)	Gross return (Rs.)

PART V PROBLEMS IN C.F.F. SYSTEM:

1. Please mention three major problems in fish farming and Rank them:

Sl.No. Problem Rank

1. ________________________________ _____

2. ________________________________ _____

3. ________________________________ _____

2. Please mention three major suggestive measures of these problems and Rank them:

Sl.No.	Problem	Rank
1.	________________________	____
2.	________________________	____
3.	________________________	____

Date: __________ **Investigated by :** ______________

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